WILLIAMS

CRUSHERS • PULVERIZERS • SHREDDERS • GRINDERS

OLDEST & LARGEST MANUFACTURER OF HAMMER MILLS IN THE WORLD

CRUSHER INSTALLATION

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FORM 852R

CRUSHER INSTALLATION

Congratulations on your ownership of a Williams Crusher. Whether you purchased it new and specifically built for your application, or it is a previously owned crusher, it will provide years of trouble-free service if the proper installation and service procedures are followed.

It is not unusual to find one of our crushers starting a second or third career after a long, productive service life for the original owner.

The purpose of this brochure is to provide a helpful guide or checklist for the various necessary steps to insure the safe and successful installation of Williams crushing equipment.

In planning the installation of a crusher, the primary consideration must be operating safety. Proper feeding, material handling, and provisions for service are necessary operating provisions. The power of the motor and speed of the crusher rotation will be determined by the quantity and size of the product desired within the design limitations of the particular size crusher.

OPERATING CONTROLS

A uniform load on the crusher motor is the most efficient method of operation for both the crusher and its motor. This can be accomplished in several ways, but the best arrangement is by a feed control device that measures the current the motor is drawing, which in turn controls the feed equipment to maintain a selected percentage of the crusher motor full load by sequencing the feed device to regulate the material flow into the crusher.

This load control is the surest way to prevent overloading and plugging of the crusher and to protect the crusher motor from overheating and tripping the circuit breaker or causing other electrical and mechanical problems.

The electrical circuit breaker or starter to control the crusher motor should be conveniently located within sight of the crusher and clearly identified with provisions for lockout during service operations. The control circuit should have an interlock to prevent the feed device from operating when the crusher motor is not energized or running. This will prevent the crushing chamber from being filled with material that would not allow the rotor to start or plug up when the crusher motor was de-energized purposely or by overload.

When the control circuit has provisions for remote starting of the crusher, ample warning signs shall be posted near every access opening on the crusher and its inlet and outlet hoppers.

SERVICE PROVISIONS

When locating the crusher in a building or near other machinery, always allow sufficient clearance to open the crusher cover and perform necessary service operations. The hammer bolts are usually removed from the side of the crusher opposite the drive to allow sufficient clearance to withdraw the full length of the hammer bolt from the rotor. When rebuilding or replacing the hammers, which is the most frequent service operation, it is always necessary to open the crusher cover. Hammers are sometimes built up to original profile by welding while they are in position on the rotor. It is almost always necessary to use a mechanical lifting device to open the cover unless the crusher is equipped with a hydraulic cover opening system. Where mechanical equipment will be used to open the crusher cover, provisions should be made for the safe, secure attachment of the lifting devices which will allow for the movement of the cover as it lifts off or pivots open. The lifting equipment for the cover need not to be permanently mounted, but the brackets or track it is supported by should be securely installed either on the surrounding structure or the crusher feed hopper; whichever provides for the safest opening of the crusher cover.

FEED CONVEYORS

The most common way of feeding a crusher is by a conveyor - either a belt or apron pan that dumps into a hopper above the crusher. Other alternatives are bucket elevators, vibratory pan feeders, or screw conveyors, and sometimes rotary pocket feeders are used to introduce the material into the feed hopper. Whichever feed device is used, it is important to avoid surges in loading and keep the bed of material flowing into the crusher as uniform as possible.

Feed devices such as bucket conveyors and screw conveyors are somewhat self-metering in that only a given amount of material is carried by each flight or bucket. Apron pan and belt conveyors, on the other hand, do not usually carry uniform height or width load so more careful control is necessary in the loading volume regulation with this type of material handling equipment. When material is dumped onto a conveyor either by a bucket loader of a truck, some type of height regulating or strike off device is needed to level the bed of material to a uniform height as it travels along the conveyor. This is sometimes done with two-stage conveyors, each traveling at different speeds, to spread the load or else using a surge bin to maintain an even flow into the crusher. Whichever conveyor or feed device is used, it should be freestanding or self-supported and not connected rigidly to the crusher or feed hopper to avoid vibration problems transmitted through the structure.

Normally, the infeed conveyor is on am incline for a portion of its length up to the feed hopper, which usually requires cleats or pushers attached to the belt or apron pans to elevate the bed of material without slipping. There should be no offsets or projections of the side skirts or shrouds along the conveyor that would catch or snag material on the infeed conveyor and cause blockage on the flow of material into the crusher. Where possible, the infeed conveyor should run horizontal for a few feet before it enters the feed hopper so the material will glow off the end of the conveyor more uniformly and keep the gap under the conveyor to a minimum where it exits the feed hopper. Where the conveyor enters the feed hopper, the opening should be high enough to permit the longest item going up the conveyor to pivot off the end into the crusher without jamming in the feed hopper or against the conveyor shroud.

The greater distance above the crusher rotor that the infeed conveyor introduces material into the feed hopper, the less chance there is of material being blown or thrown back down the infeed conveyor. There is, of course, a limit of how high above the rotor the conveyor entry is practical, but two out of three times the hammer circle diameter is a general rule for a minimum feed heights of most material handled by the conveyor.

Depending upon the height above the rotor where the conveyor enters the feed hopper, the conveyor should be covered or shrouded for a considerable distance back from the opening to prevent the material that is being crushed from blowing or flying down the infeed conveyor.

In most instances, a shroud two or three times the conveyor width in length extending back from the feed hopper entry with substantial curtain at the beginning of the shroud will provide sufficient emission control for most crushing operations where dust or powder is not being produced by the grinding process. Dust control will require additional precautions and very possibly a separate collecting system to eliminate the hazard or nuisance of dust because the large volume of air that is moved by the crusher rotor during operation.

It is very difficult to seal under an infeed conveyor equipped with cleats or pushers where it exits from the feed hopper, a dribble chute is often required to catch the material blown or thrown out under the conveyor and carry it to the discharge conveyor. The dribble chute should not have any offsets or constrictions that would cause the material to plug and fill up the chute. As a matter of precaution, the dribble chute should have an access door conveniently located near floor level for clean out.

Where damp material is conveyed into the crusher, it may be necessary to provide drip pans beneath the exposed return side of the conveyor.

Conveyors need lubrication and service which should be included in the installation plans to provide convenient access for maintenance of bearings and rolling members of the conveyor, as well as, the drive equipment.

FEED HOPPERS

The purpose of the feed hopper or chute is to spread the material being crushed uniformly across the full width of the rotor and to contain the crushing action inside the crusher. The feed hopper should be substantially constructed of steel plate and structural sections proportional to the size of the crusher it is to be used with and the type of material being crushed.

Whenever possible, the crusher feed hoppers should be isolated from both the crusher and its conveyor while it is supported by a separate structure independent of the crusher foundation.

Even when the hopper is isolated from the crusher, it should have sufficient stiffening and cross bracing to prevent any unsupported spans of metal from acting as a drum due to air or material flow or from vibration of the crusher transmitted through the foundation or support structure. Often, a slight vibration of the crusher can be magnified by a feed chute or hopper through it's structural resonance until a serious vibration condition develops which can best be corrected by isolating the hopper. The minimum isolation for the feed hopper should be a 1/2 inch resilient pad inserted between the hopper flange and the top of the crusher frame.

The hopper should have easy access for service, designed so the segment of the hopper above the crusher cover will have a flanged section that can be unbolted from the hopper and pivoted open as part of the crusher cover. Provisions for this should be made when planning the crusher installation to allow sufficient room to fully open the cover without interference from the building or adjacent machinery. Where possible, provide a separate reinforced access door for the hopper in addition to the crusher cover opening. When material is not evenly introduced through the feed opening of the hopper, it is often necessary to provide baffles or guide chutes inside the hopper to spread the material across the full width of the rotor for equal utilization of the crusher hammers.

DISCHARGE CONVEYORS

The discharge conveyor or crushed product removal equipment should have capacity greater than the infeed conveyor plus an allowance for surges and any increase in volume due to fluffing of material being crushed.

The operating controls for the feed equipment should be interlocked with the discharge conveyor controls to prevent material from being introduced into the crusher unless the crusher and the discharge conveyor is operating.

The section of conveyor immediately under the crusher is subject to impacts from the grinding operation, so shock protection in this area is required. Belt conveyors should be provided with closely spaced impact idlers in this area. An apron pan conveyor or a vibratory conveyor is usually suitable for service in this location under a crusher. Allow as much distance as possible beneath the crusher for the discharge conveyor to provide room for surges and to center the load on the conveyor without interfering with the crusher foundation. This is especially important when using a vibratory pan conveyor which is best installed with a downward slope away from the crusher to positively move the crushed material, which may change its density from moment to moment.

Whenever possible, the discharge equipment should carry the product away from the crusher perpendicular to the rotor so the maximum foundation support will be provided beneath the crusher bearings. The discharge conveyor should be tightly shrouded to control dust and noise emissions or reverse airflow through the crusher.

Air swept hogging or shredding operations require careful design of the discharge chute and blast gate to maintain the proper velocity and volume of air through the pneumatic conveying duct to insure that material does not accumulate in the bottom of the crusher or duct that would impede the air flow and its carrying capabilities.

Additional conveyor operating information is available in Williams Form 898.

FOUNDATIONS

The foundation of the crusher has a most significant role in the successful operation of the installation and control of vibration.

The foundation provides the mass to dampen the crusher's normal operating vibration and absorb impact shocks. The general rule for crusher foundations is to provide a reinforced concrete pedestal extending as one unit under both the crusher and its drive that weighs at least three times the equipment it will support.

The arrangement of the foundation geometry is very important to react against the forces developed by the crusher operation. The height of the foundation should never be greater than its width unless spread footing is used under the foundation to prevent rocking and distribute the weight so that the soil loading is never more than 500 pounds per square foot.

The foundation pressure on the supporting soil is very important when dealing with a dynamic condition. The soil loading should not cause an interaction of the crusher vibration with the soil's natural frequency due to its deflection that would result in foundation critical. This is especially important when moisture in the soil is involved to insure the foundation had adequate support and impose a soil loading no more than a quarter of the recommended static values for the particular type of soil under the proposed crusher foundation.

Additional information is available in Williams Form 902 - Crusher Foundations.

When the crusher is set on the foundation, make certain it is level and supported uniformly to avoid distortion of the bearing pedestals when the anchor bolts are drawn tight. Assemblies shipped from the factory that are mounted on structural base plates should be properly aligned before connecting the drive motor after they are mounted on the foundation.

Additional information is available in Williams Form 901 - Alignment.

We suggest you have your foundation plans reviewed by qualified structural engineers having expertise in dynamic loading.

WILLIAMS

INSTALLATION AND REMOVAL OF COUPLINGS & FLYWHEELS

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FORM 903R

INSTALLATION AND REMOVAL OF COUPLINGS AND FLYWHEELS

Introduction

The inside diameter of couplings and flywheels are bored .002" less than the end of the shaft they are to be mounted on for an interference or press fit. To avoid distortion or excessive stress concentrations, the coupling halves and flywheel are usually heated to approximately 300°F when mounting them on the shaft. They are also heated when it is necessary to remove them from the shaft.

Installation

Several methods can be used to uniformly heat the coupling half or flywheel, but controls are needed to avoid overheating the unit or a particular area that would cause distortion.

A gas fired oven is ideal to heat the large flywheels and coupling halves where lifting equipment is available to handle the items in and out of the oven.

It is important to apply sufficient heat in a reasonable length of time to uniformly heat the item so that one section does not cool before the entire piece is expanded sufficiently to slip on the shaft. When heating with an acytelene torch, use a "rosebud" tip to distribute the heat better than a conventional cutting tip, and if possible use more than one torch.

Start heating at the outer edge and proceed toward the center, but take care not to apply heat directly to the inside of the bore. Use a contact thermometer or Tempil stick to check the surface temperature of the piece as it is heated. Usually a uniform 275° to 300°F is sufficient to expand the bore of the item enough for it to easily slip onto the shaft.

To determine that the flywheel or coupling half is sufficiently heated "mike" the I.D. when the temperature indicators show the surface is about 300°F to see if it is at least .003" larger than the diameter of the shaft on which it is to be mounted.

NOTE: The 22" x 4" flywheel weighs 300 pounds. The 30" x 6" flywheel weighs 832 pounds. The outside face of the flywheel can be determined by the name WILLIAMS stamped over the keyway. Older models without the name stamp can be oriented by the keyway which is deepest at the face and tapers to the back. The balance correction holes are drilled into the inside face of the flywheel. Unless the outside face is properly positioned, the tapered key will not fit and the hammer bolt holes will not line up for hammer removal.

Coupling Mounting

Depending on coupling design, the cover section is slid on the shaft before the coupling half is mounted.

The heated coupling half is slid onto the shaft until the end of shaft is flush with the face of the coupling or the inside shoulder in the case of gear type couplings.

A slightly undersize or "dummy" key is used to maintain the keyway position until the coupling has cooled sufficiently to grip the shaft. The full size fitted key is then driven flush with the face of the coupling.

NOTE: The inside corners of the keyways on all WILLIAMS equipment are machined with a fillet to prevent a stress concentration common to sharp inside corners. The key will have to be chamfered to match the keyway fillets. It is good practice to coat the shaft end and key with a "Never-Seez" compound to assist in their eventual removal. The key is held in place on couplings up to 5 inches in diameter by a set screw in the hub.

Flywheel Mounting

Clean and deburr the end of the shaft, then coat it with a "Never-Seez" compound to prevent galling. Measure from the inside edge of the lock ring groove along the shaft a length equal to the width of the flywheel and mark the location or clamp a stop to prevent the flywheel from sliding too far onto the shaft.

An undersize dummy key is used to line up the keyway in the shaft and flywheel while the heated flywheel is slid into position. It is important to lift the flywheel so the bore remains concentric with the shaft as it is slid on the shaft to prevent it from seizing before it is all the way on the shaft. When the flywheel has cooled sufficiently to grip the shaft, the tapered key is fitted and cut to length flush with the outside face of the flywheel when it is driven firmly in position. They key is held in position by the Spir-O-Lox ring wound into the groove on the end of the shaft.

Removal of Coupling or Flywheel

Removal of a coupling half or flywheel from the end of a shaft requires heat and a pulling force. A fair estimate of the pulling force required in tons can be arrived at by multiplying the shaft diameter by ten. For example, a 5" diameter shaft will require somewhere around 50 tons to remove a shrink fit coupling or flywheel even when heat is used.

On smaller diameter coupling halves, remove the set screw holding the key in place before starting to heat it for removal.

Connect the pulling device to the item to be removed before starting to heat it.

NOTE: Never attempt to remove a coupling half or flywheel by driving or pounding with a slege hammer if the shaft or discs will be used again.

Remove the Spir-O-Lox retaining ring from its groove in front of the flywheel before applying heat or pulling force.

The tapered key in the flywheel can be driven out from the rear with an offset tool provided no corrosion has developed to prevent it from moving. If the tapered key can not be driven out, the puller plate should cover the key so it will be pulled with the flywheel. Never allow the flywheel to ride up on the tapered key which will make it almost impossible to remove without extensive cutting with a torch.

Heating

Apply heat to the flywheel with a "rosebud" tip acytelene torch commencing at the outside edge and working gradually to the shaft on both faces with more than one torch if possible. Check the surface temperature with a contact thermometer or Tempil stick to make certain all areas are heated a uniform 275° to 300°F. Keep the shaft cool with a wet rag wrapped out of the way of the pulling device.

Flywheel Pulling

When the flywheel starts to warm up, commence applying pressure to the puller gradually building up to maximum pressure when the item is fully heated to about 300°F. When the flywheel starts to move, continue to apply pressure uniformly to keep it moving to the end of the puller stroke or the flywheel may seize on the shaft if it is allowed to sit without moving. It may be necessary to use a spacer with the puller if its stroke is shorter than the flywheel width.

Make certain that the flywheel is adequately supported before it is pulled off the end of the shaft. Then set it somewhere out of the way to cool so it will not fall over, roll, or accidentally burn someone. It requires more than an hour from a 6" wide flywheel to cool.

Coupling Removal

Make certain that heat is not directed on the grid teeth or gear teeth of the coulping half. It is best to start heating the coupling directly over the keyway which usually expands first and allows the coupling to be pulled off without too much effort, but size puller capacity to shaft diameter so that sufficient force is available to move coupling.

It will usually be necessary to have an extention on the puller or a spacer to fit inside the coupling because the cylinder stroke is often less than the coupling length.

Make arrangements to support the heated coupling half as it is removed from the shaft and set it in a safe location until ready to remount it.

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HYDRAULIC & LUBRICATION UNIT INSTALLATION & SERVICE

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FORM 874

The hydraulic power unit furnished for most Williams' large crusher installations is designed to function either by manually actuated electrical or mechanical controls requiring only periodic inspection and service. A copy of the electrical schematic and parts list for each hydraulic power unit is shopped inside the cover of the control cabinet that is mounted on the top of the reservoir. Several configurations of the hydraulic power unit are possible depending upon the functions it is to perform and the method used to cool the oil.

These installation and start-up instructions will apply to all Williams' hydraulic power units regardless of their configuration. The piping connecting the crusher to the hydraulic unit will be furnished and installed by others and arranged to suit the requirements of each particular installation within the guidelines of these instructions.

INSTALLATION

A general arrangement of the piping for a large reversible crusher is shown on drawing 141-B-4819 on page 7 of this form.

1. The hydraulic power unit must be installed in a clean and protected location that is shielded from the elements with adequate ventilation.

2. The frequency and voltage of the power supply shall not exceed the nameplate voltage on the pump motor and shall be properly fused to protect it from overload.

3. The top of the hydraulic unit reservoir must be at least six feet below the bottom of the bearings of the equipment it is lubricating to insure a proper gravity flow in the drain lines from the bearing housings.

4. There must be access to all sides of the power unit for inspection and service with sufficient clearance for any maintenance operation.

5. The mounting platform under the hydraulic power unit must be isolated from all operating equipment vibration and leveled in both directions.

6. All pipe used to connect the hydraulic power unit to the Williams equipment except drain lines shall be new Schedule 80 black iron pipe, kept clear and free of all debris by proper capping before and after installation. All threaded connections to be cleaned and reamed free of all burrs and cuttings. Pipe joint compound or Teflon tape shall be used on all NPT connections, but not on any fine threaded fittings.

7. Flexible connections shall be used between the hydraulic power unit and the rigid piping and from the piping to the crusher to avoid vibration problems. The flexible lines connecting the rigid piping to the crusher components that must move, such as covers, should have sufficient slack to permit the full movement without strain on the flexible lines.

8. The hydraulic piping shall be arranged along the side of the equipment so it will not cover access to any portion of the equipment that must be regularly inspected or serviced, and kept below the hinge of the cover or any moving component so the piping will not interfere with the movement.

9. The drain lines from the bearing housings to the power unit shall be Schedule 40 black iron pipe at least 1 1/4 inch diameter. The connecting lines from the drain assembly out of the bearing housing furnished with the crusher shall be run as direct as possible to the power unit with the least amount of horizontal runs to maintain a 1 foot in 10 slope. Unless the drain lines are properly sloped, it will be difficult to regulate the flow of lubricant through the bearing housings.

10. It may be necessary to insulate or heat trace the drain lines when they are exposed to freezing temperatures to insure the oil flows properly.

11. The heat exchanger to cool the lubrication oil is either air or water cooled, which will require dust protection for the air supply or filtration and freeze protection for the cooling water to insure the lubrication oil is properly cooled before it is circulated to the bearings.

12. The electric heater for the oil reservoir should be connected to a separate circuit that remains energized full time to maintain a temperature range of 70° to 90°F in the reservoir even when the power unit is shut down. When the equipment is installed in areas where the ambient temperature falls below 20°F, the lubrication circulation system should operate full time to maintain a uniform temperature on the equipment bearings even if the crusher is not running. A signal light on the control cabinet indicates when the heating element is operating.

START-UP AND OPERATION

1. When the installation is complete and all the lines are properly connected to the equipment, fill the power unit with the specified type of oil until the level is at the full mark on the reservoir sight glass. It is recommended that a closed type of pumping system be used to transfer the oil from the shipping containers to the power unit reservoir. Do not use open containers or remove the inlet filter when filling the power unit reservoir.

2. Check to see that all the connections are made to the proper end of the cylinders in the sequence they are intended to operate. The hydraulic cushion cylinders of reversible crushers should be connected so the piston end of the cylinders are connected to the normally open port of the solenoid valve. Once these cylinders are pressurized, it is dangerous to change the lines unless the pressure is relieved on the hydraulic pneumatic accumulators by manually repositioning the solenoid valve spool when the power to the hydraulic unit is off.

3. The lubrication supply lines to the bearings are connected to the plug opening in the center of the bearing housing slightly off center from the top of the housing. Do not confuse the large plugged openings on either side of the housing and cap which are for inspection and positioning the inside oil flingers with the oil entry port for the bearing.

4. Check the filters on the power unit to see that they are in place and properly tightened and that both control valves for the suction filters are open so oil can flow to the pump. The bearing lubrication flow control valves should both be fully open when initially starting up, then they can be regulated to control the flow when the system is operating.

5. Briefly “bump” the hydraulic pump motor to determine if it has the proper rotation. If the rotation is correct as indicated by the direction arrow, allow the unit to run for a few seconds until the low pressure alarm turns off- then shut the power unit down to flush out the lubrication supply lines as follows:

    a. Disconnect the flexible connection to the bearing housings and direct the line to an empty five gallon container.

    b. Start the pump and allow it to run for several minutes until sufficient oil has flowed through the lines into the container to purge any debris from the supply lines. Dispose of this waste oil.

    c. Connect the supply line through a temporary by-pass to the drain lines so the lubricating oil can circulate without passing through the bearing housing.

    d. Start the pump and circulate the oil through the lines with the by-pass coneection for several hours to insure that any foreign matter in the lines is flushed into the reservoir where it will be trapped by the pump suction filters.

6. When the flushing is complete, reconnect the supply lines to the bearing housings and reconnect the drain lines to complete the lubrication circuit. Start the pump to regulate the flow through the bearing housings which is adjusted by the two flow control valves on the power unit which should be labeled by the piping installer to identify which bearing each flow valve supplies. This is done easiest by fully closing both valves by turning the knobs clock-wise, and then opening them two full turns while the pump is operating. The correct flow through the bearing housing is when the oil level is at the center of the sight glass on the side of the bearing housing. If the drain lines from the bearings are installed correctly with the proper grade, the flow adjustment should be ways to maintain whether the crusher is operating or not. It may be necessary to adjust the flow control valves slightly from the two-turns open position, to maintain the oil level in the center of the bearing housing sight glasses while the equipment is operating. The low pressure supply to the bearings should be between 60 and 90 psi on the control panel gauge which can be adjusted by regulating the spring pressure in the relief valve on the power unit. The spring adjusting screw is under the removable cover on the pressure relief valve. The return drain lines have sight glasses where they enter the reservoir to show when the oil is flowing through the lines and permit examination of the oil condition or to check on contamination.

7. When the hydraulic lines to the operating equipment such as cover opening cylinders or breaker plate positioning cylinders are pressurized, refill the power unit reservoir with the specified type of oil until the level is flush with the “full” mark on the sight gauge.

8. Check all hydraulic and lubricating lines for leaks after verification that they are connected to the proper location on the equipment to insure proper functioning when the controls are actuated. The cooling water supply and drain lines should be checked for proper connection and temperature setting on the controls when the flow is adjusted to the heat exchanger.

OPERATION AND TROUBLE_SHOOTING

Lubrication System

The low pressure 60 to 90 psi lubrication system for the bearings operates whenever the power unit is running and the flow control valves are open. The only adjustment necessary would be to regulate the flow to the bearing housings to maintain the oil level in the center of the sight glasses.

The filter in the lubrication line that is located on the top of the power unit should be replaced after the initial 100 hours of operation, and whenever the pressure differential between the gauges in the line before and after the filter is more than 4 psi to insure the lubrication oil is kept clean.

The suction filters are located underneath the reservoir in the line before the pump and should be replaced after the first 100 hours of operation, and after every three months of normal service. Before removing the suction filter, close the manual plug valve from the reservoir to prevent the oil draining when the line is open. The suction filter cartridges for both the high pressure and the low pressure pumps are the same and are easily installed with an allen wrench.

The thermostat to control the heat exchanger cooling action is located inside the control cabinet and should be set to start the cooling when the lubrication oil reaches 120°F, which is adjustable by a dial on the thermostat to indicate the set point.

The high temperature alarm thermostat is located alongside the heat exchanger thermostat inside the control cabinet and it should be set to sound the high temperature alarm when the oil reaches 180°F. When the alarm sounds, indicating the lubricating oil is dangerously hot, check the heat exchanger to see that the cooling water is flowing properly or whether the air cooling fan is operating or if the coils are clogged on the air-to-oil cooling unit.

The reservoir heating element is located in the bottom of the tank with the connection box thermostat located on the lower right side of the tank with a screw-on cover for access to the thermostat. The heating element does not directly contact the oil to prevent oxidation of the oil from contact with the high temperature element, so the temperature regulation will have to be adjusted periodically as the ambient air temperature varies to maintain a range of 70° to 90°F in the lubrication oil. The thermostat dial is marked in degrees Farenheit so it is easy to see the desired set point. A neon indicating light on the cabinet face shows when the heating

element is operating as a visual check to see if the heater is functioning. The power supply to the heating element should be on a separate circuit so it remains on full time even when the rest of the system is shut down.

Hydraulic System

The high pressure system (up to 2000 psi) is used to open the cover and adjust the breaker plates on reversible crushers or simply open the cover on non-reversible crushers.

The high pressure pump operates full time when the power unit is energized although the pressurized oil may only circulate through the heat exchanger when operation is not required by the cylinders.

The controls for the hydraulic power can be either manually operated valves or solenoid operated valves, which can be controlled by push buttons located near the equipment operating position or in a central station. Manual valves are shipped mounted on the power unit, but they can be relocated off the power unit and close to the equipment site by the installaton contractor so the operator can observe the cover opening.

The high pressure power system for reversible crushers is normally set at 300 psi to open the breaker plates forward and keep them closed unless it is necessary to open them by reversing the solenoid valve. When higher oil pressure is required to open the cover, the 300 psi pressure relief valve is by-passed by the cover opening valve routing the oil through another relief valve to provide up to the 2000 psi required to raise the cover.

The solenoid valve is normally trouble-free unless the spool of the valve is held open by a speck of debris from the oil lines or the coil is damaged by the wrong voltage supply.

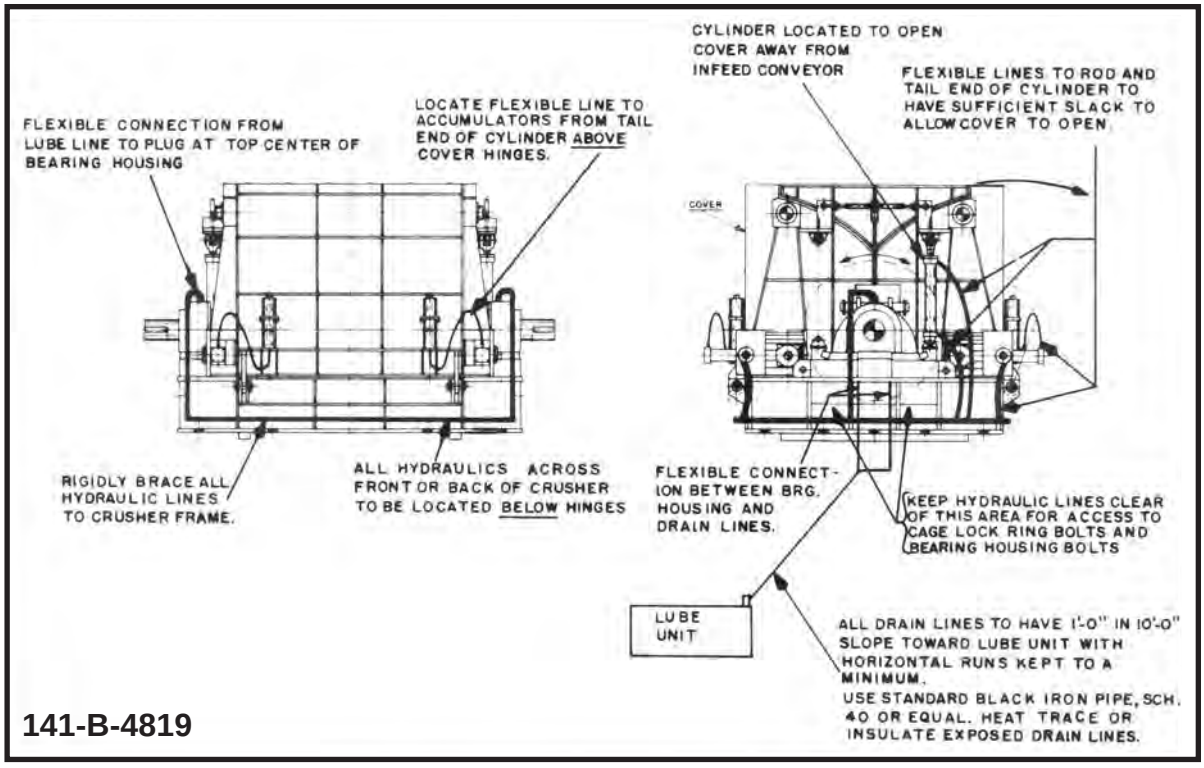
Cover Opening

When the crusher cover is to be opened, the drive motor starter controls are to be locked off and tagged. The rotor must have come to a complete stop before starting to open the cover.

Remove all the bolts from the cover flanges on both sides of the crusher and across the back of the crusher as well as the flanges of the hopper except for the bolts holding the hopper segment to the crusher cover. Reversible crushers only have the bolts removed from the cover that is to be opened, in addition to disconnecting the ratchet turnbuckles from the sides of the cover and positioning them safely out of the way so they will not interfere with the service operations.

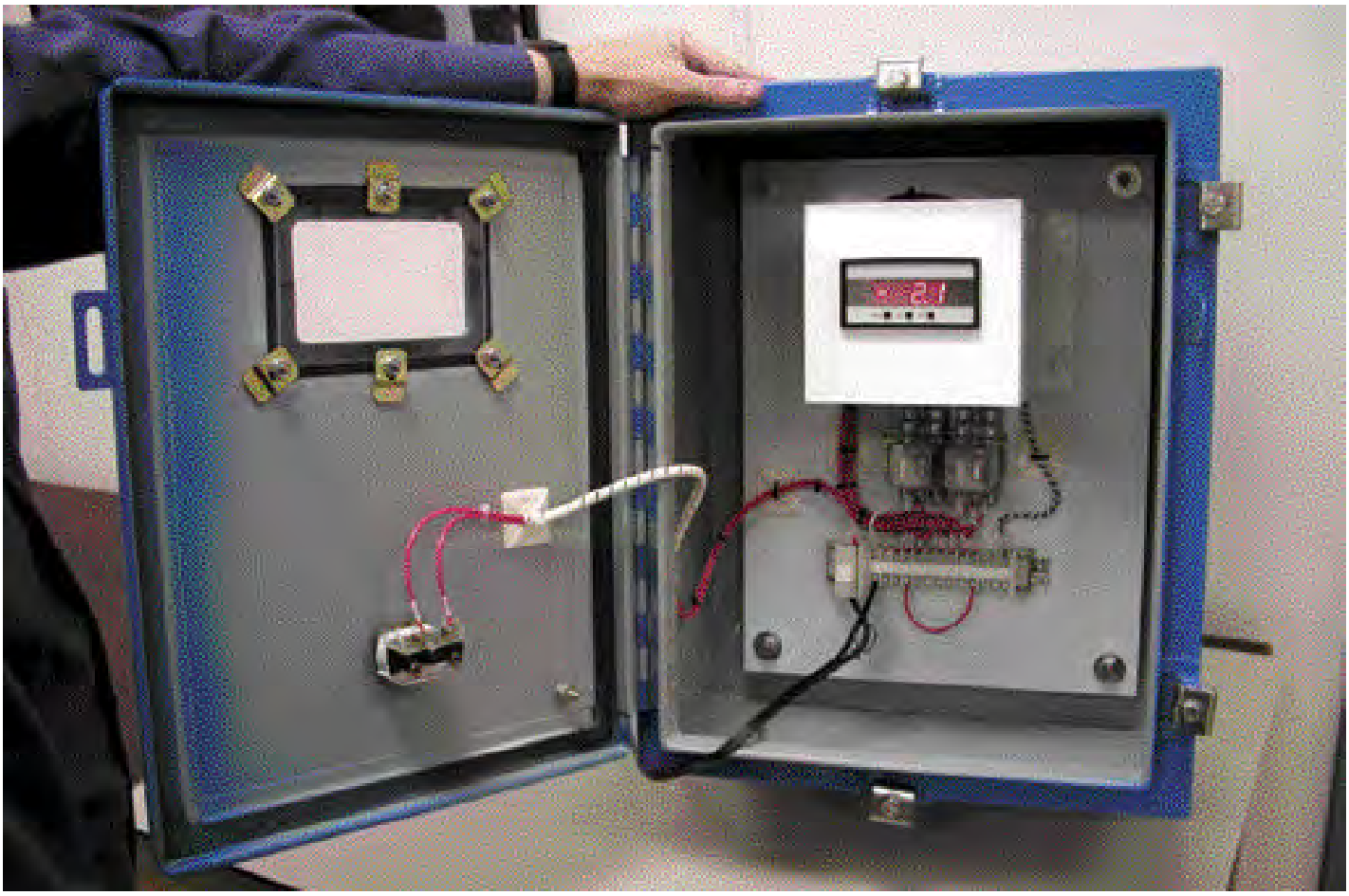
When all the preparations are complete, actuate the controls to open the cover by pressurizing the hydraulic lines to the cover opening cylinders. It requires 30 to 40 seconds for the pressurized oil to reach the cylinders and have them start extending. It requires an additional minute or so for the cover to fully open while the operator is holding the manual valve lever or depressing the control button. Unless the control is continuously depressed, the cylinders will stop operating and will remain where they were when the control was released.

To close the covers, the reverse of the above procedure is followed when all personnel are free and clear of the crusher or its cover.



WILLIAMS Model E Feed Control

Automatic Stop/Start Protection from Overload.
For motors driving crushers, pulverizers,
other size reduction equipment, and conveyors.



Approximate size of the Model E Feed Control Panel is 20” x 16” x 8”

The Williams Digital Model E is an automatic feed control that will regulate the in-feed conveyor or other devices. This maintains a uniform load on the mill or drive motor by stopping the feed to the mill when an overload develops.

The control circuitry is housed in a 20” x 16” x 8” NEMA 4 dust and waterproof enclosure with a viewing window on the door of the Digital Panel Meter.

The Digital Model E provides a continuous reading via a digital meter relay which constantly measures the load on the mill motor and displays the value as a percentage of full load current from 0 - 150%. When the current is equal to or greater than the upper adjustable setpoint (SP1 FSR) for a one (1) second interval the feed control will stop the feeder. When the percent of full load drops below the upper adjustable setpoint (SP1 FSR) for one (1) second the control will restart the feeder. There are two (2) adjustable setpoints with isolated contacts. The Upper Setpoint (SP1 FSR) is used to turn off the feeder. The Lower Setpoint (SP3 MR LO) can be used to turn on and off water sprays in the shredder hopper, or other devices, if needed or desired. When it is set properly, water sprays will be energized only when there is a “load” on the shredder motor. There are also two (2) non-isolated setpoints (SP2 & SP4) which can be used to start/stop other equipment as needed at different load levels.

BULLETIN 796R2

Installation

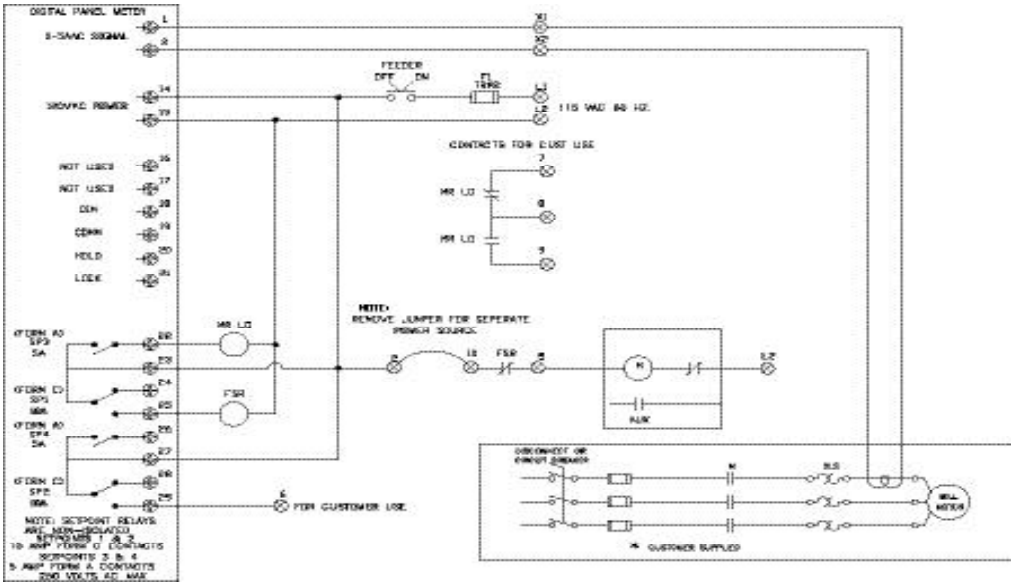
The control panel is mounted in a NEMA 4 enclosure. This cabinet should be mounted vertically into a clean and protected location that is shielded from the elements and free of vibration. It can be located remote from the “controlled” equipment.

Wiring

1. Connect 115 volt, single phase, 50 or 60 cycle power supply to terminal strip marked “L1 and L2.”
2. Slip the “Donut” current transformer over one of the mill motor leads and connect the current transformer leads to the terminial strip marked “X1 and X2.”
3. Connect the feeder motor starter coil to terminial strip marked “5 and L2.” NOTE: Relay contacts are rated for 10 ampere maximum at 115 volts, 5 ampere maximum at 230 volts and 2.5 ampere maximum at 460 volts.
4. Connect the feeder motor auxiliary contacts to terminial strip marked “2 and 6.”
5. Connect lower adjustable set point devices to terminals 7, 8, and 9. Contacts 7 and 8 are normally closed and open when the current is equal to or greater than the lower adjustable set point. 8 and 9 are normally open and will close.
6. All wiring must be in accordance with local standards.

To Order

To order a new Model E Feed Control Panel, please specify your mill motor full load current, voltage, frequency, phase, and horsepower.



Operation

Use the On/Off switch on the cover of the panel to energize the control system.
WARNING: The timers have been set at the factory and any change may result in damage to the mill motor.

Load Limit Selection

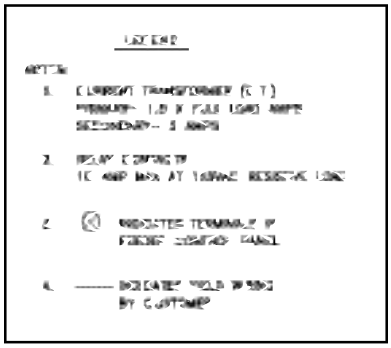
Set upper adjustable set point for upper limit to any percentage of mill motor full load current. Set lower set point just above “no load” condition for the motor.

Periodic Observation

Observation of the indicating digital meter will show the percentage of full load current being drawn by the mill motor.

Automatic Feed Shutoff

Automatic feed shutoff is actuated when mill motor load is equal to or greater than the upper set point for a 1 second interval, then the feeder restarts when the load drops below the upper set point for a 1 second interval.



WILLIAMS
PATENT CRUSHER and PULVERIZER CO, INC.
2701 North Broadway, St. Louis, MO U.S.A. 63102
Phone: (314) 621-3348 Fax: (314) 436-2639
Website: www.williamscrusher.com Email: sales@williamscrusher.com

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RECOMMENDED BUILD UP ROD

STOODY NICROMANG®

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FORM 768R2

STOODY
A Thermadyne Company

Stoody Nicromang®
Shielded Metal Arc Welding Electrode

DESCRIPTION

Stoody Nicromang deposit is an austenitic manganese steel with excellent impact strength. It has a high deposition rate and work hardens under impact. Deposits can be flame cut. It is designed for build up and joining of manganese steels and is not recommended for buildup of carbon steels. There is no limit to deposit thickness. When welding, the interpass temperature should not exceed 500°F.

TYPICAL DEPOSIT CHARACTERISTICS

Abrasion Resistance	Moderate
Impact Resistance	Excellent
Hardness as Deposited	200 HB
Hardness as Work Hardened	HRC 52
Magnetic	No
Surface Cross Checks	No
Machinability	Poor
Deposit Layers	Unlimited
Maximum Interpass Temperature	500°F

ALLOY TYPE

Austenitic Manganese Steel

TYPICAL APPLICATIONS

- Railroad Frogs and Crossings
- Crusher Equipment Parts
- Manganese Steel Castings
- Wobbler Spindles
- Coupling Boxes

OPERATIONAL CHARACTERISTICS / WELDING PARAMETERS

Diameter, In. (mm)	**1/8 (3.2)**	**5/32 (4.0)**
Current, Amp. DCEP	100 – 160	140 – 200
Position	Flat / Horizontal	Flat / Horizontal
Rod Length	14”	14”

Diameter, In. (mm)	**3/16 (4.8)**	**¼ (6.4)**
Current, Amp. DCEP	170 – 225	230 – 330
Position	Flat	Flat
Rod Length	14”	18”

Diameter, In. (mm)	**5/16 (8.0mm)**
Current, Amp. DCEP	270 – 390
Position	Flat
Rod Length	14”

STANDARD SIZES

Diameter	Packaging	Part #
1/8” (3.2mm)	60#	45150850
1/8” (3.2mm)	10#	45150810
5/32” (4.0mm)	60#	45151050
5/32” (4.0mm)	10#	45151010
3/16” (4.8mm)	60#	45151250
3/16” (4.8mm)	10#	45151210
¼” (6.4mm)	60#	45151650
¼” (6.4mm)	10#	11498800
5/16” (8.0mm)	60#	45152050

Stoody Company
5557 Nashville Road • Bowling Green, KY 42101
1-800-227-9333

PDS-MN-E-001
Revision 2
08/02/02

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RECOMMENDED HARD SURFACE ROD STOODY® 21

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sales@williamscrusher.com www.williamscrusher.com

FORM 769R3

STOODY
A THERMADYNE Company

Stoody® 21
Shielded Metal Arc Welding Electrode

DESCRIPTION

Stoody 21 is a tubular electrode with good impact and abrasion characteristics. Deposits are not machinable or forgeable. Stoody 21 bonds well with carbon, low alloy, and manganese steels. Deposits are slightly magnetic on carbon and low alloy steels, but no on manganese steels, and will develop cross checks.

TYPICAL APPLICATIONS

Typical applications include:

- Compactors
- Mill Hammers
- Buckets and Bucket Teeth
- Dredge Pumps

TYPICAL DEPOSIT CHARACTERISTICS

Abrasion Resistance	Good
Impact Resistance	Moderate
Hardness	
On Carbon Steel	HRC 52 – 56
On Manganese Steel	HRC 46 – 50
Magnetic	
On Carbon Steel	Slightly
On Manganese Steel	No
Surface Cross Checks	Yes
Machinability	No
Deposit Layers	2
Hot Wear Applications	Up to 800°F

OPERATIONAL CHARACTERISTICS / WELDING PARAMETERS

Diameter, In. (mm)	**1/8 (3.2)**	**5/32 (4.0)**
Current, Amp. DCRP	90 – 130	120 – 160
Position	Flat	Flat

Diameter, In. (mm)	**3/16 (4.8)**	**¼" (6.4")**
Current, Amp. DCRP	140 – 220	175 – 300
Position	Flat	Flat

ALLOY TYPE

Eutectic Chromium Carbides in an Austenitic Matrix

STANDARD SIZES & PACKAGING

Diameter	Packaging	Part #
1/8" (3.2mm)	10# Box	11172700
1/8" (3.2mm)	50# Bulk Pak	10205200
5/32" (4.0mm)	10# Box	11172900
5/32" (4.0mm)	50# Bulk Pak	10205600
3/16" (4.8mm)	10# Box	11173000
3/16" (4.8mm)	50# Bulk Pak	10205700
¼" (6.4mm)	10# Box	11173100
¼" (6.4mm)	50# Bulk Pak	10205800

Stoody Company
5557 Nashville Road • Bowling Green, KY 42101
1-800-227-9333

PDS-CRC-E-003
Revision 1
08/02/02

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HAMMER MILL INSTRUCTIONS

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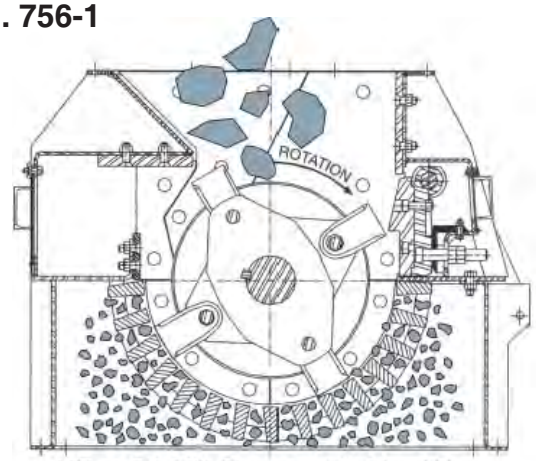
FORM 756-R2

This form is intended to serve as a guide for the installation, operation, and maintenance of your Williams Hammer Mill Equipment. This form refers to Hammer Mills, Rigid Arm Hammer Mills, Breakers and Shredders, Rotating Ring Crushers, and similar rotating Williams Grinders, Hogs, and Shredders. For convenience, they will be referred to herein as “mills.”

Installation, operation, and maintenance are each discussed separately so as to give you as much specific information as possible.

All Williams Mills, regardless of size, are run at the factory prior or shipment. They are mechanically sound when prepared for shipment and all but the largest sizes are shipped as an assembled unit. Machines too large to be shipped in one piece can be assembled without difficulty. The proper relation of the several sections will be quite obvious upon visual inspection. When properly installed, lubricated, and maintained, your Williams Mill will give you great service for many years.

FIG. 756-1



NF or GA Mill Slugger with Metal Trap

FIG. 756-2

FOUNDATION: The mill should be supported on concrete, steel, or heavy timbers, the setting to be strong and heavy enough to carry the weight of the mill and driving motors while being sufficiently rigid to assure permanent alignment of the mill and its driver. (It is highly recommended that Williams Form 902R2 - *Crusher Foundations* be referenced while designing the mill foundation.) This foundation is to be isolated from any building foundation so as not to transmit vibration into the building. The foundation is to be level and uniformly even with anchor bolts located as per specifications on **certified** Williams installation prints. Bolt the mill assembly down solidly, shimming to make certain that it remains level in both directions. Check this level along the shaft and bearing pedestals. Care should be exercised when drawing up the foundation bolts so that the mill frame is not warped out of position due to an uneven or unlevel foundation. When a mill and motor base are used, the entire assembly is set on its foundation in the same manner as described above. Next, flush in grouting material to give a good bearing between the mill and foundation. Although a Williams Mill is a heavily built machine, care must be exercised to prevent damage in handling. Whether a hoist, crane, or jack is used to lift the machine, under no circumstances should a strain be put on the mill shaft. Always lift the machine by the lower frame, placing the strain on the well braced bottom flanges. See Fig. 756-3.

The lifting lug provided on the removable cover section of many models is for your convenience in removal of this portion of the mill only and **will not** carry the weight of the entire mill.

FEED CHUTE: All mills should be equipped with adequate feed chutes. If there is any design question, check with the factory. Consult with the factory for the vertical drop distance between the feed inlet and the mill.

ACCESSIBILITY: The interior of your Williams Mill is easily reached for repairs and adjustments by simply opening the removable half of the cover. Therefore, leave sufficient room around your mill to provide comfortable working space and for the removal of the mill cover and hammer bolts. The hammer bolts are usually removed from the side opposite the drive. See Fig. 756-4.

SAFETY: It is the customer's responsibility to provide and to keep in operation - shrouds, guards, or similar safety devices - necessary to prevent material or tramp iron from being thrown out at the feed opening of the mill or feed hopper - for safety of all personnel. Please refer to Williams Form 936 - *General Safety Procedures* for operation of Williams Equipment, prior to operating equipment.

Personnel in the vicinity of the equipment when in operation should take the precaution of wearing Personal Protective Equipment (hard hats, safety glasses, ear plugs, etc.).

OPERATION

STARTING THE MILL: It is important that your Williams Mill be operated at the recommended speed. Under no circumstances should any Williams Mill be operated at a greater speed than that specified by the Williams factory, nor should the speed be lowered without factory approval. Before starting the mill, inspect the grinding chamber carefully and turn the mill by hand to be certain that it is free of all obstacles that may have found their way into the interior of the mill. Check direction of rotation to see that it is the same as that indicated by the direction arrows on the sides of the mill, or on Williams drawings.

When you start the mill under power, permit it to attain full speed **before any material is fed into it.**

PROPER FEEDING: Material being fed into a Williams Mill should be spread evenly over the entire feed opening and should be conveyed into the mill continuously and uniformly at a feed rate not greater than that recommended by the factory. Keep in mind that surge feeding is inefficient as it tends to overload the mill, thereby causing the machine to use excess power. An alternate overload and underload condition of operation will average far below the results obtained by steady feeding of the right amount of material. For some materials, automatic feeders are essential - for practically all, they are beneficial.

Feed size of material should be limited to the maximum sizes recommended by the factory. Excessively large pieces of material place undue strain on the shaft and other parts of the machine. Uncrushable material such as steel and iron should be removed from the feed before it enters the mill even though the mill is equipped with a metal trap. A metal trap is by no means 100% effective and severe damage may be sustained to the mill before uncrushable material can be removed.

FIG. 756-3

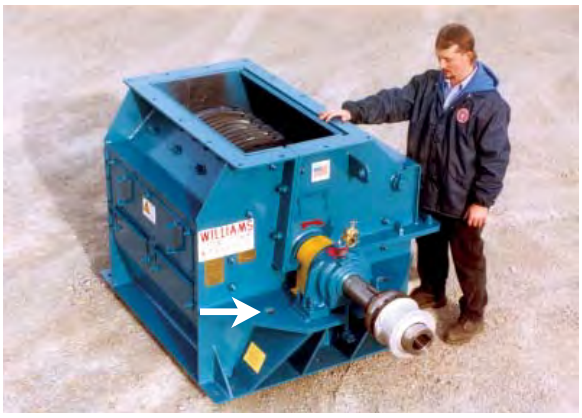
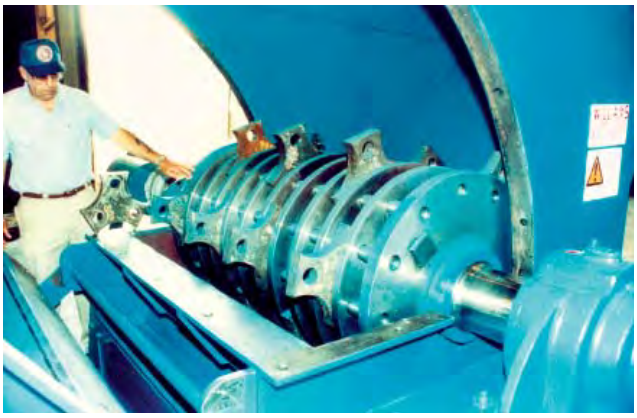


FIG. 756-4



HANDLING OF PRODUCT: The chute, air system, belt or screw conveyor, etc., regardless of what conveyance system is used to remove the hammer mill product, must be of sufficient capacity to handle peak loads without temporary accumulations of product occurring under the mill. This is necessary to prevent the product from plugging the mill and shutting down its operation.

FINENESS ADJUSTMENTS: Fineness adjustments are mentioned in their order of accessibility and ease of change; and will produce a finer product. Conversely, a reversal of below recommendations will produce a coarser product.

1. On mills having adjustable breaker plates, adjust the breaker plate closer to the hammers to compensate for wear on the breaker plates and grinding plates (Note- on new mills the breaker plates have been correctly set at the factory and the mill is ready for operation).

The procedure for adjusting the breaker plate assembly is as follows: with the mill running empty, loosen the locking bolts a couple of turns and slowly turn the adjusting bolt. This will force the breaker plate to move inward toward the hammers. Alternate between loosening the locking bolts and turning the adjusting bolt in until you hear or feel the hammers lightly graze the breaker plate. Install shims (an adequate supply is always shipped with the mill) so that the breaker plate may be withdrawn approximately 1/16". **Lock shims in place.**

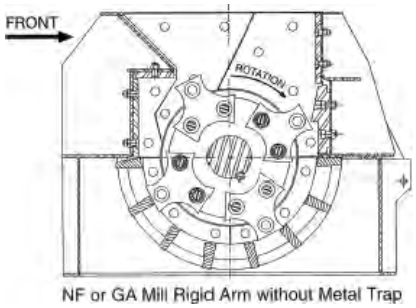
Now, tighten the locking bolts so that a moderate pull is exerted on the breaker plate assembly away from the hammers - this prevents the breaker plate assembly from chattering and insures that all shock loads derived from crushing will be directed against the shims which are designed to take this load. See Fig. 756-1 and 756-2 for adjustable breaker plates, Fig, 756-5 and 756-6 for fixed breaker plates.

2. Changing Cage Openings: By reducing the size of the cage openings, a finer product will be made, but the output is decreased as the making of a finer product places more work on the mill. See Fig. 756-7.

3. Changing the Speed: A higher speed will generally produce a product which is finer, however, there are many limitations. The maximum safe speed for the machine cannot be exceeded. Too great a speed will not allow the feed to get between the hammers, thus reducing the efficiency of the mill. An increase of speed will require more power, therefore make no change in the mill speed without first consulting the factory.

4. Decreasing the Number of Hammers: In certain instances where a coarser product is more desirable, this can sometimes be obtained by removing hammers from the mill. However, we do not recommend that this be done without first consulting the factory and it is always necessary to keep in mind that the balance of the rotor must be maintained.

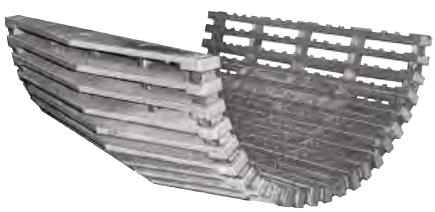
FIG. 756-5



NF or GA Mill Rigid Arm without Metal Trap

FIG. 756-6

FIG. 756-7



MAINTENANCE

LUBRICATION: Possibly no detail is as important to the life of a machine as proper lubrication of the contact surfaces of moving parts. We advise always that you lubricate as local conditions warrant for your installation, keeping in mind that care must be exercised to prevent over lubrication. **Too much lubrication will cause a bearing to heat.** Bearing operating temperatures vary with geographical location and ambient temperature at the installation. If there is any doubt about lubrication, consult factory or a qualified lubrication expert. Be sure to review Williams Form 911R - *Roller Bearings* for additional information.

GREASE LUBRICATION: For all moving parts which have a standard grease gun fitting supplied, use Mobile Grease Mobilith AW2 or its equivalent.

OIL LUBRICATION: For all moving parts which use oil as a lubricant, use an oil which has the following characteristics:

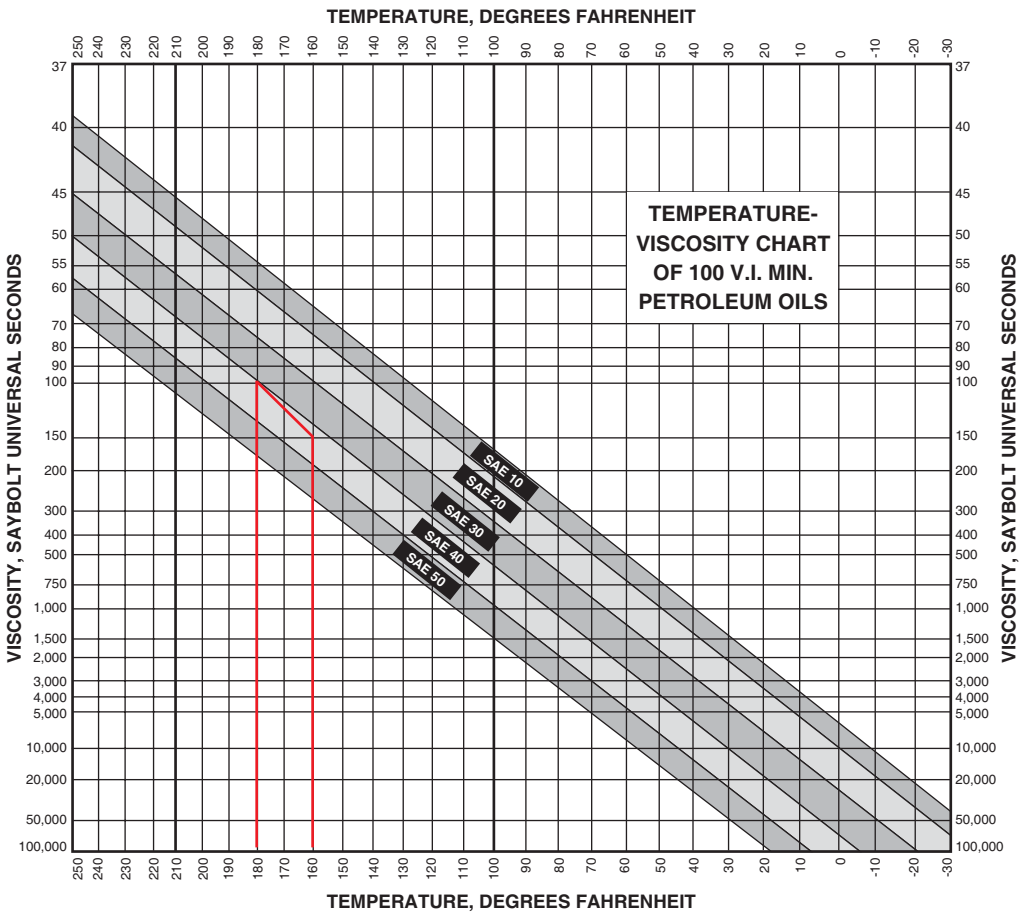
1. The viscosity of the oil should be between 105 SSU and 150 SSU at the operating temperature of the bearing. Usual operating temperature of the bearing is within the range of 160°F - 180°F.

2. The oil should yield a “Timken Okay Load” of 45 pounds minimum.

3. The oil should contain EP additives.

The viscosity of an oil is perhaps the most fundamental consideration in bearing applications. The table below provides a relative guide in determining the viscosity of oil at various temperatures.

TABLE 756-1



Viscosities of oils are usually given at either 100°F or 210°F. To determine this viscosity, find the intersection on the chart of the expected operating temperature and the Saybolt Universal Seconds (SSU). From this point draw a line parallel to the nearest curve. Where this line intersects the 100°F or 210°F coordinate will be found the viscosity in the Saybolt Universal Seconds at either of these standard base temperatures.

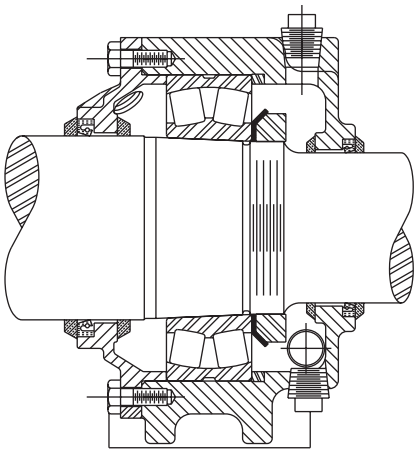
Table I is simply an oil selection guide. It is based on oils with a high Viscosity Index (V.I.) which are necessary for satisfactory bearing operation. **It is always preferable to consult a competent lubrication engineer for a more specific recommendation**, particularly if the conditions are in the areas above or below the family of curves.

Mills with oil lubricated bearings have the bearing housing filled to the proper level with the appropriate oil for normal operation. The bearings housings **must be flushed** before operating and be filled with the correct lubricant for your installation.

For installations where bearings are in an oil sump, or reservoir, we recommend that the mill run for 45 minutes in unloaded condition to lower the viscosity of the oil to the proper operating range.

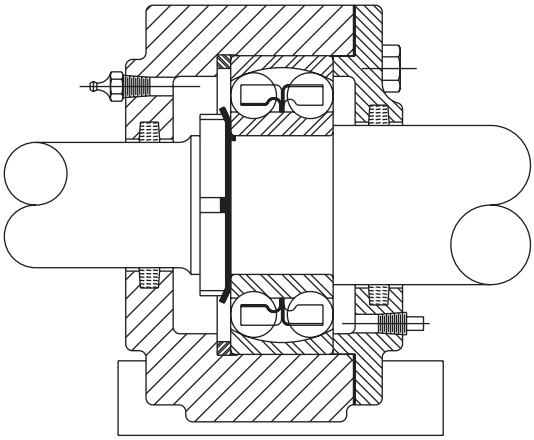
How often you should flush all bearings and reload their lubricant depends upon the conditions of location and operation. However, to establish a basis for normal operating conditions, it is recommended that bearings be flushed and re-filled once a month.

FIG. 756-8



Typical Grease Lubricated Pillow Block - Location of grease fitting may vary.

FIG. 756-9



Typical Oil Lubricated Pillow Block - Manual Lubrication.

It should be a rule that any time grit is found in a bearing, the bearing is to be cleaned and inspected for wear and the defect which allowed the grit to leak into the bearing corrected immediately. All bearing housings are designed to prevent grit from entering from the outside.

Should lubrication instructions be supplied with a bearing or mill, they take precedence over those recommended here.

HAMMER CARE & ADJUSTMENT: Whenever the nature of the work intended for the mill permits the efficient use of reversible hammers, one of Williams' standard reversible styles is installed. Of course, when "double end" reversible types can be used four wearing edges are available by reversing and also inverting the hammers. See Fig. 756-10 and 756-11. Reference Williams Form 768 - *Williams #1 Build Up Rod* and Williams Form 769 - *Williams #2 Hard Surface Rod* for additional information.

With hammers which must cut by impact as well as by sharpness, such as in a Wood Hog or Metal Turnings Crusher, after the hammer tips have become rounded from wear, they should be built up by welding rod or by forging as in the case of tool steel hammers. It is our experience that hammer tips worn down more than 3/4 inch are more expensive to repair than the purchase of new hammers. Regular maintenance to the tips is a must. After building up the hammer tips or hard surfacing - if the hammers were removed - make sure that opposing hammers weigh the same when reinstalling them into the mill to maintain balance. See Fig. 756-12.

FIG. 756-10

FIG. 756-11

Reference Williams Form 952R - *Hammers* for additional information on balancing hammers.

For any type of hammers which exhibit undue wear due to a very abrasive product, hard surfacing is recommended. Contact the factory for the proper procedure and hard surfacing rod for your particular problem.

FIG. 756-12

Note: Should build up rod or hard surfacing rod be applied to hammers while they are still assembled in the hammer mill, be sure to maintain balance between opposite rows of hammers and always connect the welding ground so that the electrical circuit **does not** pass through the mill bearings.

REPLACEMENT PARTS: Replacement parts should be ordered in anticipation of their need to prevent the possibility of a costly interruption to your production schedule. The grinding elements, particularly, should be carried in stock so as to be immediately available when needed. The grinding elements consist primarily of hammers, breaker plates, grinding plates, cage bars and/or perforated cages. A spare bearing is also a good investment.

Do Not Permit the Liners to Wear Through before replacing them. Liners protect your investment by protecting the mill frame from impact and abrasion. They are furnished in all Williams Mills which are intended for heavy duty or abrasive service.

Periodical Inspections are good operating practice. At such times, bearings, discs, hammer bolts, hammers, breaker plates, liners, liner bolts, cages, adjusting screws, and all frame members should be inspected carefully. Be sure all bolts are securely tightened.

Possible Problems:

1. Vibration. After a mill has been in service for some time, wear will affect the balance of the rotating assembly causing vibration. Another source of vibration could be from a sprung shaft. A shaft can be sprung by feeding the mill uncrushable material, loading it excessively, or feeding material larger than that originally intended for the mill.

2. Loss of Capacity or Product Size. This is largely due to wear on the crushing segments and generally can be compensated for by adjusting the breaker plates or hammers, or replacing worn parts.

3. Clogging. Clogging as explained earlier can be caused by not conveying the product away from the mill fast enough or it can be due to worn parts which do not grind properly and thus clog the mill. Other possibilities include excessive moisture, oil, etc. in the mill feed.

GENERAL INFORMATION: Always specify the Serial Number of your Williams Mill in all correspondence pertaining to it, and you will help us to render better service. Always specify the Serial Number when inquiring about, or ordering, repair parts. You will further help us to give you good service by specifying the drawing number of the repair parts required. If the name plate has been accidentally removed, the Serial Number has been stamped into the bearing pedestal on the drive side on mills manufactured as of June 1954.

Consult Williams if you have a special problem related to grinding, shredding, crushing, pulverizing, separating, or screening. We are specialists in our field and would be happy to help you.

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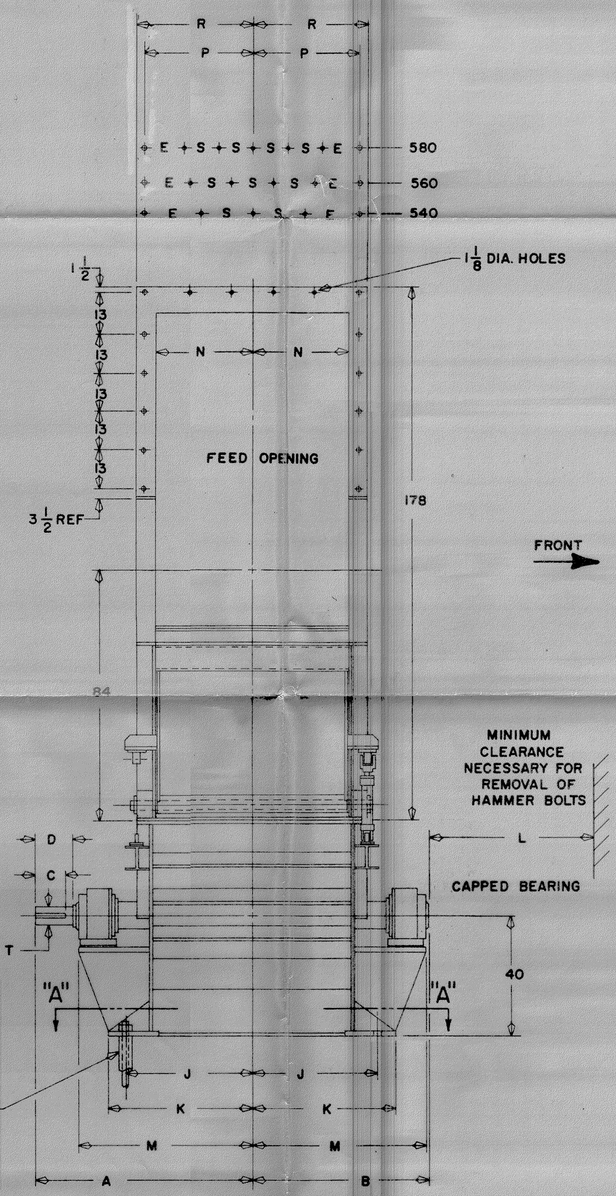
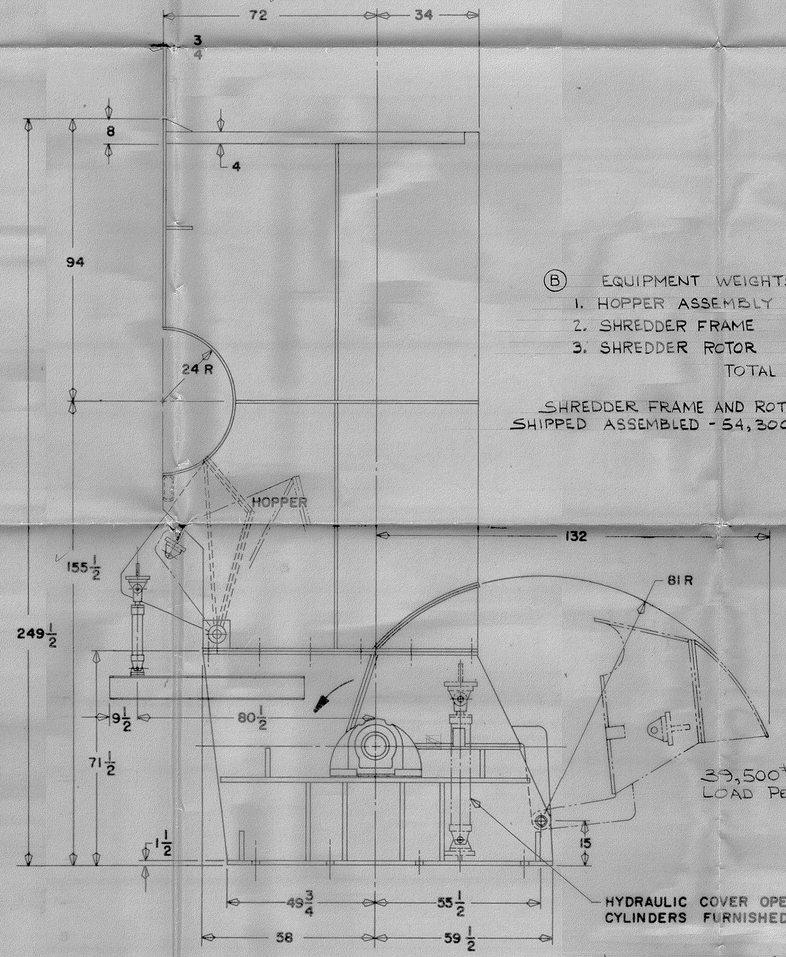


FRONT ELEVATION



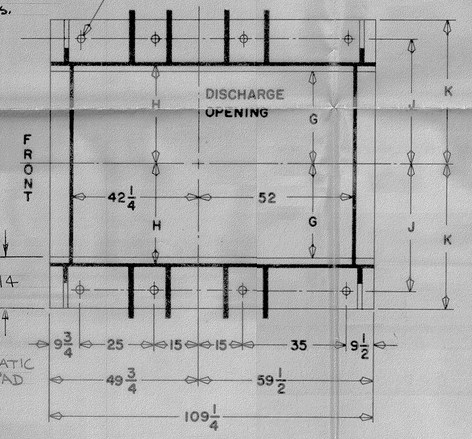
SIDE ELEVATION

ALL CYLINDERS ARE PARKER HANNIFIN SERIES "2H".

Ⓑ EQUIPMENT WEIGHTS

1.	HOPPER ASSEMBLY	24,700
2.	SHREDDER FRAME	37,900
3.	SHREDDER ROTOR	16,400
	TOTAL	79,000 LBS.

SHREDDER FRAME AND ROTOR TO BE SHIPPED ASSEMBLED - 54,300 LBS.



SECTION "A-A"
ROTATED 90° C.W.

SIZE	A	B	C	D	E	F	G	H	J	K	L	M	N	P	R	S	T	KEYWAY
540	62 7/8	50	10	12 13/16	13 1/4		21 1/4	23 1/4	32 1/4	38 1/4	22 7/8	48 1/4	22 1/2	25 3/4	28 3/4	12 1/2	5 15/16	1 1/2 x 3/4
560	72 7/8	60	10	12 13/16	14 3/4		31 1/4	33 1/4	42 1/4	48 1/4	42 7/8	58 1/4	32 1/2	35 3/4	38 3/4	14	5 15/16	1 1/2 x 3/4
580	82 7/8	70	10	12 13/16	15 3/4		41 1/4	43 1/4	52 1/4	58 1/4	62 7/8	68 1/4	42 1/2	45 3/4	48 3/4	15	5 15/16	1 1/2 x 3/4

SUPPORT MILL ON CONCRETE FOUNDATION HAVING WT. 3-4 TIMES WT. OF MILL/BASE/HOPPER COMBINED. DESIGN FOUNDATION TO SUPPORT FULL LENGTH OF BASE FLANGES UNDER BEARINGS. (ALL FOUNDATIONS BY OTHERS)

ALL DIMENSIONS ARE IN INCHES AND ARE SUBJECT TO CHANGE UNLESS CERTIFIED.

USE A CERTIFIED DRAWING FOR CONSTRUCTION OR INSTALLATION.

DIMENSIONS CERTIFIED FOR
KAISER ALUMINUM AND CHEMICAL CORP.
S.N. 17532 P.O. 135M994904
WILLIAMS PATENT CRUSHER AND PULV. CO. S. O. NO. 801835
DATE 8-28-80 APPROVED BY Don Yoss

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ZONE	SYM.	DATE	INITIALS	REVISION DESCRIPTION
B3	B	10/23/80	DA	ADD EQUIPMENT WEIGHTS
A2	A	9/29/80	DA	ADD STATIC LOAD & CYL. NOTE

THIS PRINT WAS ISSUED — THIS DRG. SUPERSEDED BY — THIS DRG. SUPERSEDES

TOLERANCES: Fractional Dimensions ±1/64" · Decimal Dimensions: Zero to 2.999" ± .005" · From 3" thru 6" ± .010" · All Threads U.S. Form 3B, Class 2 unless otherwise noted

FINISHES: f_1 Rough Cut to Clean Up · f_2 Fine Lathe Cut · f_3 Fine Lathe Cut & File Smooth · f_4 Fine Lathe Cut & Grind

WILLIAMS PATENT CRUSHER AND PULVERIZER CO. ST. LOUIS, MO.

500 SERIES SHREDDER WITH HOPPER

DRAWN BY DA · TRACED BY · DATE Y-S-YE · SCALE 1/2" = 1'-0" · CHECKED BY · DRWG. NO. 200H-E-8685 · REVISION B

STD. -4- DWG. SHT. 8/76 - 500 M27544

PART	When Ordering Repairs Give { Part Wanted, also Quantity, This Drwg. Number and Machine Serial Number	CODE	QUANTITY IN MACHINE
1	Mill Frame	E787100	1
2	Mill Cover	E787101	1
3	Left Front Side Liner shown Right Front Side Liner Opposite	E787532	1 Each
4	Left Center Side Liner shown Right Center Side Liner Opposite	E787533	1 Each
5	Left Back Side Liner Shown Right Back Side Liner Opposite	E787534	1 Each
6	Breaker Plate	NF-420-H	_____
7	Breaker Plate	NF-221X-H	_____
8	Breaker Plate	BC-420-H	_____
9	Back Cover Cross Liner	_____	_____
10	Cage Hold Down Segment Clamp	NU509	6
11	Cage Hold Down Segment	NU504	6
12	Cage Hold Down Segment (Used on mills not requiring clamp #10 & hold down segment #11 listed above)	D951738	6
13	Cage Bar or Grid	_____	_____
14	Tapered Key - Bearing Stop	D525004	2
15	Clamp for Tapered Key	D525005	2
16	Cover Hinge Pin Assemblies	E629517	2

PART	When Ordering Repairs Give { Part Wanted, also Quantity, This Drwg. Number and Machine Serial Number	CODE	QUANTITY IN MACHINE
	The folllowing Cover Opening Cylinder and Parts are optional equipment:		
17	Gusset	D914040	2
18	Top Support Plate	D91404B	2
19	Top Eye Bracket	D914042	2
20	Top Pivot Pin	D914044	2
21	Rod Clevis	D914043	2
22	Cover Opening Cylinder	D914041	2
23	Bottom Pivot Pin	D914046	2
24	Bottom Eye Bracket	D914045	2
25	Bottom Support Plate	D914047	2
26	Gussett	D914039	2

ROTOR - See Separate Parts List
200J-B-5231

BEARINGS - See Separate Parts List
61J-B-3052

NON-EXPANSION BEARING PLLOW BLOCK FOR DRIVE SIDE
EXPANSION BEARING PILLOW BLOCK FOR OPPOSITE DRIVE SIDE

Mill Serial Number_____

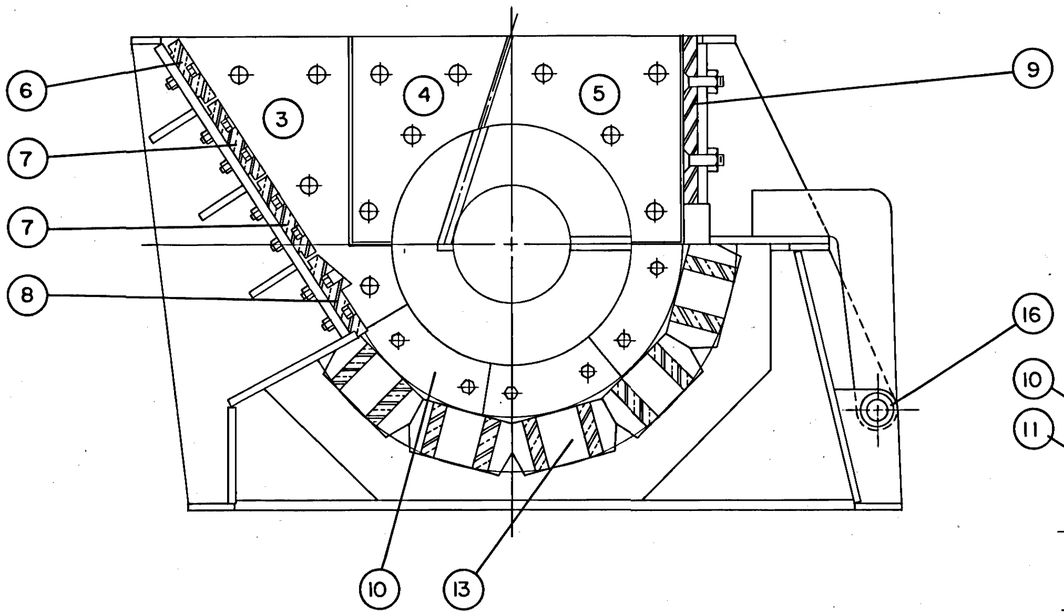
B/M No._____ Rev._____

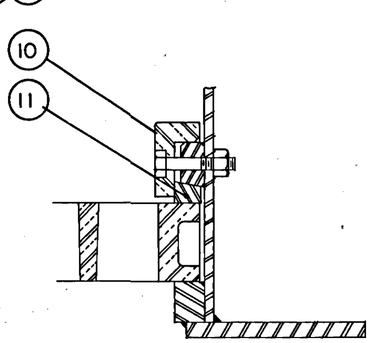
When Ordering Repairs Give { Part Wanted, also Quantity, This Drwg. Number and Machine Serial Number

FOR PARTS LIST SEE 200J-B-5232

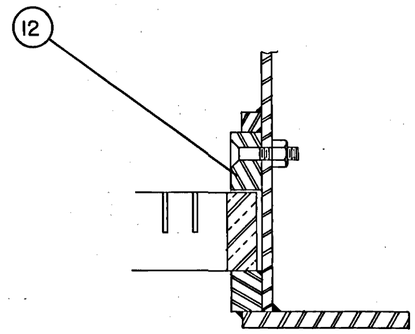
MILL SERIAL No. _____

B/M No. _____ REV. _____

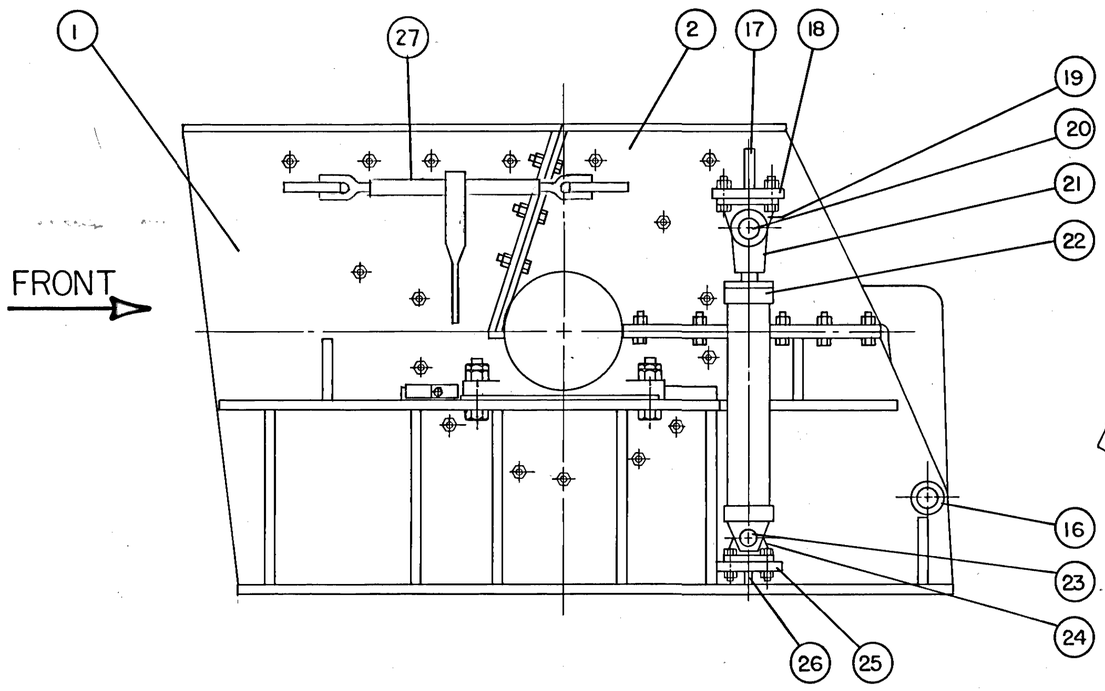


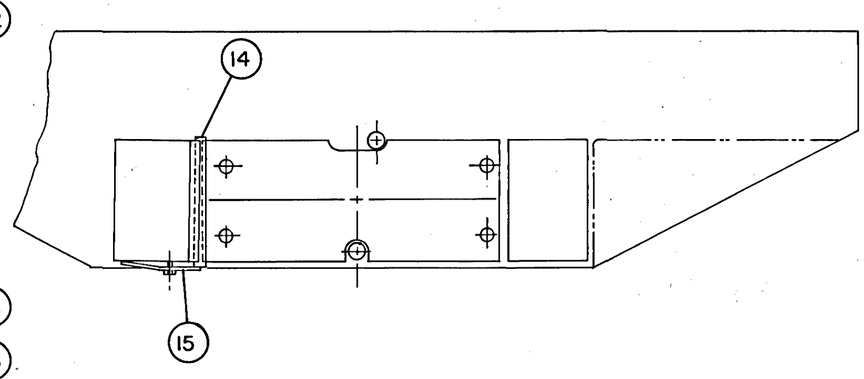


CAGE RETENTION
WITH LOCKING WEDGES



CAGE RETENTION
WITHOUT LOCKING WEDGES



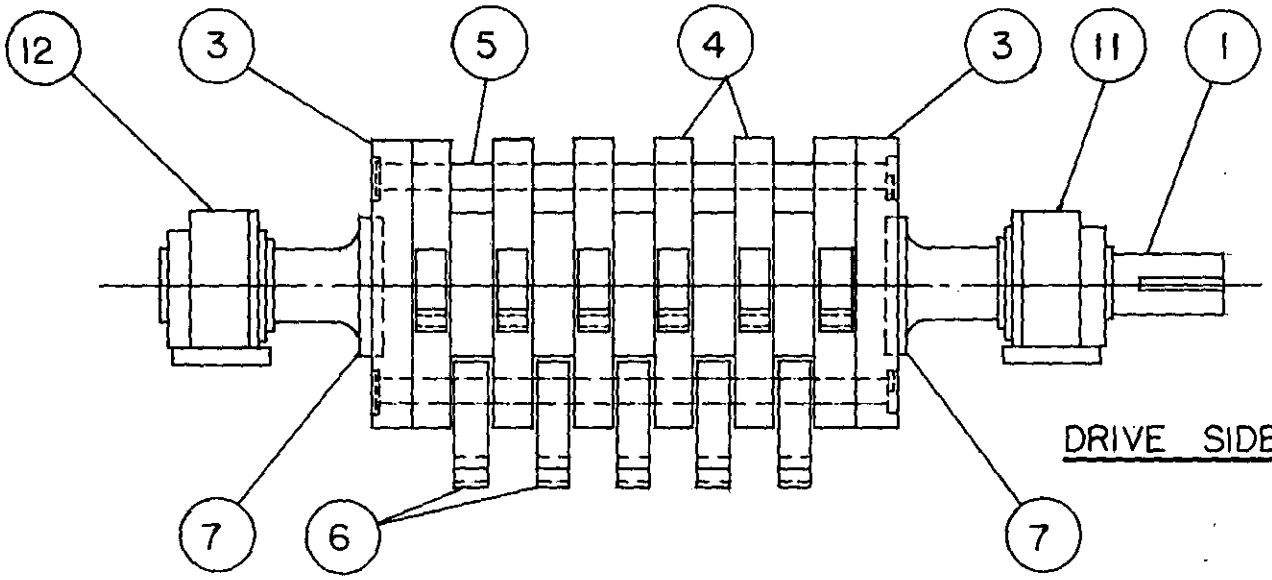


WILLIAMS PATENT CRUSHER AND PULVERIZER CO. ST. LOUIS, MO.		
PARTS DRAWING – 500 SERIES REFUSE SHREDDER		
DRAWN BY: DA	TRACED BY:	DATE: TT-YE
CHECKED BY:	APPROVED BY:	SCALE: ———
		DRWG. NO.: 200J-D-9559

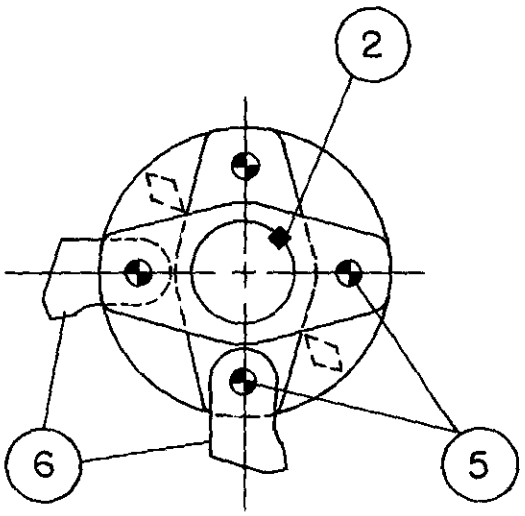
PART	When Ordering Repairs Give { Part Wanted, also Quantity, This Drwg. Number and Machine Serial Number	CODE	QUANTITY IN MACHINE
1	Main Shaft (Replcement Shaft includes Key Part No. 2)	_____	1
2	Shaft Center Key	_____	1
3	End Disc	E787602	2
4	Center Disc	E787601	_____
5	Hammer Bolt	E787603	4
6	Hammers	_____	_____
7	Shaft Locknut	B440301	2
8	Hammer Bolt Retainer Insert	D7808A1	4
9	Hammer Bolt Retainer Disc	D7808A2	4
10	Hammer Bolt Stop	D7808A3	4
	For the following items, see Separate Parts List in Williams Form 911, 61J-B-3052		
11	Fixed Bearing Pillow Block - Drive Side	E6432	1
12	Floating Bearing Pillow Block, requires 4 bolts, nuts & lockwashers	E6432	1

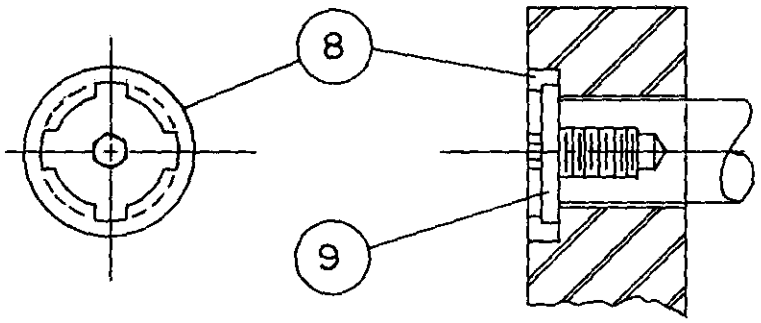
Mill Serial Number _____

B/M No. _____ Rev. _____

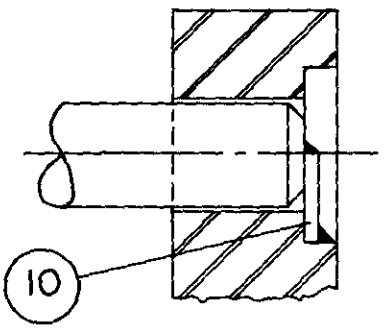


DRIVE SIDE





HAMMER BOLT LOCK INSERT
OPPOSITE DRIVE SIDE

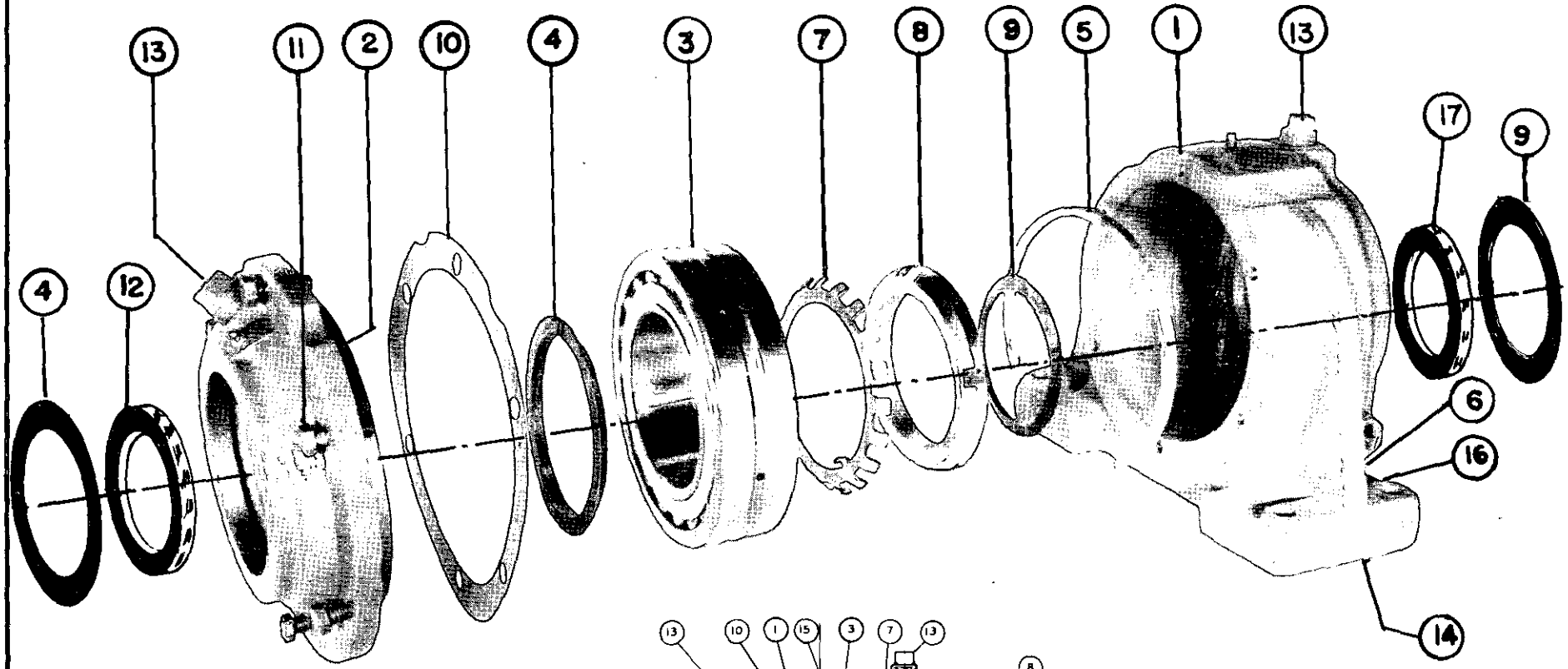


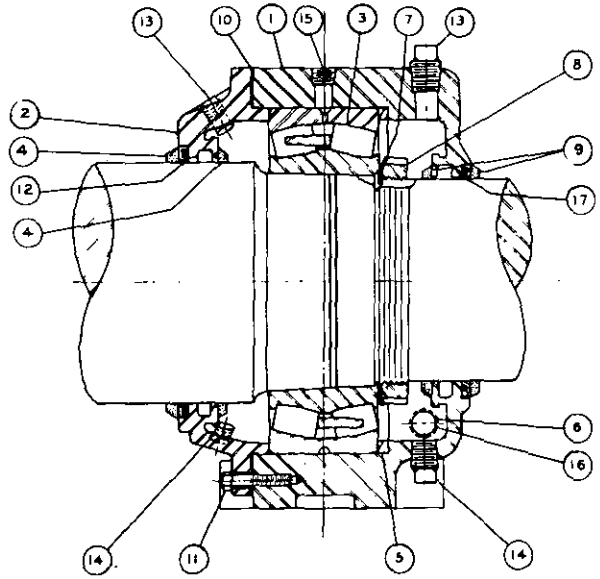
HAMMER BOLT STOP
DRIVE SIDE

MILL SERIAL No. _____

B/M No. _____ REV. ____

Williams PATENT CRUSHER AND PULVERIZER **Co.** ST. LOUIS, MO.	PARTS DRAWING - ROTOR FOR 500 SERIES REFUSE SHREDDER	SHEET 2 OF 2
		200J-B-5231





NOTE - SHOULD ROTOR OR BEARING BE REMOVED - WHEN RE-ASSEMBLING ALWAYS REMOVE INSPECTION PORTS(13) AND CHECK TO SEE IF OIL SLINGERS (9) AND (4) ARE CORRECTLY POSITIONED AGAINST THEIR MATING SURFACES. IF NOT, PRY INTO POSITION.

WHEN REMOUNTING BEARING-MEASURE INTERNAL RADIAL CLEARANCE OF BEARING WITH A SHIM GAUGE - FORCE BEARING ON SHAFT IN EASY STAGES UNTIL THE ABOVE NOTED RADIAL CLEARANCE IS REDUCED .0035 IN.

WILLIAMS PATENT CRUSHER AND PULVERIZER **CO.**
ST. LOUIS, MO.

PARTS LIST FOR MODEL "O"
8"TAPER BORE PILLOWBLOCK
WITH CONT. OIL LUBRICATION

DRAWN BY	TRACED BY	DATE A - W
D.S.K.		SCALE
CHECKED BY	APPROVED BY	DRWG NO 61 J-B-3052

PART	When Ordering Repairs Give { Part Wanted, also Quantity, This Drwg. Number and Machine Serial Number	QUANTITY IN MACHINE
1	Pillow Block Housing	1
2	Pillow Block Cap	1
3	Roller Bearing	1
4	Oil Slinger, Large Bore (should lightly rub Pillow Block Cap)	2
5	Stabilizing Ring (used on drive side only)	1
6	Oil Sight Gauge	1
7	Bearing Locknut Washer	1
8	Bearing Locknut	1
9	Oil Slinger, Small Bore (should lightly rub Pillow Block Housing)	2
10	Gasket	1
11	Cap Screws	6
12	Oil Seal, Large Bore	1
13	Inspection Port Pipe Plug	2
14	Oil Drain Plug	2
15	Oil Line Connection	1
16	Not shown is a Thermocouple connection located opposite to the Oil Sight Gauge (6) in Pillow Block Housing (1)	
17	Oil Seal, Small Bore	1

WILLIAMS PATENT CRUSHER AND PULVERIZER CO.
ST. LOUIS, MO.

PARTS LIST FOR MODEL "O"
8" TAPER BORE BEARING WITH
CONTINUOUS OIL LUBRICATION

DRWG. NO. 61J-B-3052

SHEET NO. 2 of 2

FALK
a good name in industry

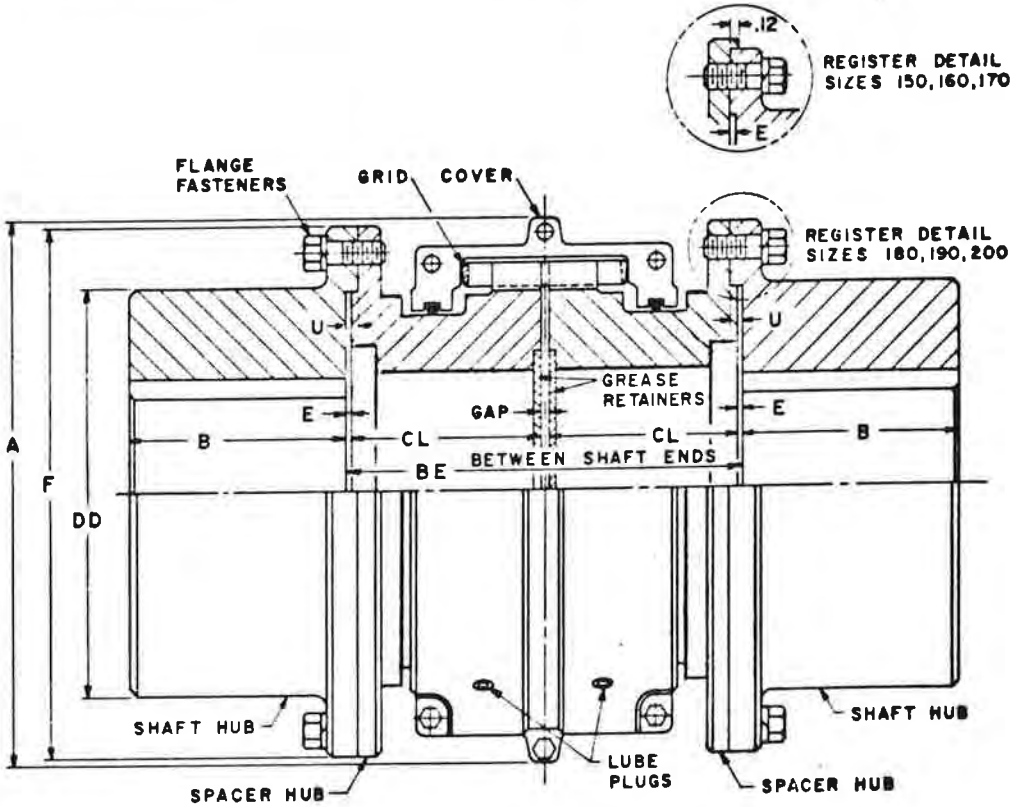
THE FALK CORPORATION
MILWAUKEE

Steelflex Spacer Assembly Both Shaft Hubs with Straight Bores

SIZES 150 thru 200

STEELFLEX COUPLINGS
Tapered Grid
Type T31 Spacer
Subject to change without notice

[redacted]
DIMENSIONS
November 1975
NEW



P/L # 1188166

SIZE ★	Basic Rating	Max Speed rpm‡	Shaft Hub Bores: Max 1-Rect Key	Shaft Hub Bores: Min ▲	Cplg Wt with No Bore & Min BE Dim lb	Lube Wt lb	DIMENSIONS — INCHES: A	B	BE: Max	BE: Min	DD●	E	F	U	Min Gap	FLANGE BOLTS: No Per Flange & Grade	FLANGE BOLTS: Dia	SIZE ★
150T	275	1500	9.500	2.750	860	4.2	17.84	6.250	14.625	13.562	12.500	.188	16.750		.34✓	14 Gr8	.750	150T
~~160T~~	~~300~~	~~1350~~	~~10.750~~	~~3.000~~	~~1140~~	~~6.2~~	~~19.24~~	~~8.938~~	~~16.000~~	~~14.000~~	~~13.750~~	~~.250~~	~~18.000~~		~~.375~~	~~14 Gr8~~	~~.750~~	~~160T~~
170T	520	1225	11.750	3.500	1580	7.7	22.30	8.188	17.500	15.125	16.000	.312	20.750		.375	16,Gr8	.875	170T
180T	710	1100	13.000	4.000	2380	8.3	24.80	9.812	19.312	15.750	17.750	.188	23.250	.312	.375	16,Gr5	1.000	180T
190T	960	1050	14.250	4.500	3220	9.7	26.50	10.875	20.875	16.188	20.000	.188	26.000	.312	.375	18,Gr5	1.125	190T
200T	1280	900	15.000	5.000	4100	12.4	29.80	12.000	22.625	17.500	20.875	.250	28.000	.375	.375	18 Gr5	1.125	200T

★ Unless otherwise specified hubs will be furnished for INTERFERENCE FIT without set screw. Dimensions are for reference only and subject to change without notice unless certified.
‡ Consult Factory for speeds higher than shown.
▲ Minimum bore is smallest bore to which hub can be bored.
● Dimension DD is for an as-cast, unmachined surface for Sizes 180, 190 and 200.

SIZE & TYPE	ONE SHAFT HUB: Bore	Keyway	Fitted To	Fitted By	OTHER SHAFT HUB: Bore	Keyway	Fitted To	Fitted By	SPACER HUBS: BE	CL
150T31	5.9335 5.9350	$1\frac{1}{2} \times \frac{3}{4}$	P.S.	PUR.	R.S.B.	-	P.S.	PUR.	16.00	7.64

CERTIFIED PRINT OF FALK COUPLING FOR WILLIAMS PATENT CRUSHER & PULVERIZER

DRAWN C. SERAFIN	DATE	9-29-80	
CHECKED C.S.	NO. REQ'D.	ONE	
DRAWING NO. 1191549	FOR UNIT ON M.O.	-	
	P.O.	218090	
	COUPLING M.O.	E-02-220-01	

Litho in U.S.A. The Falk Corporation, subsidiary of Sundstrand Corporation. 1065P59
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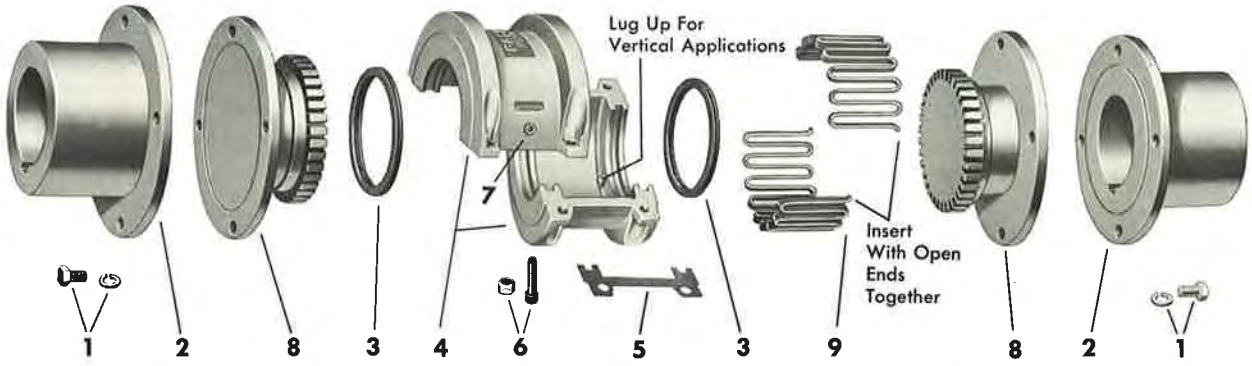
TYPE T31 STEELFLEX SPACER COUPLING



1. **Flange Fasteners**
2. **Flanged Shaft Hub** (Specify bore and keyway)
3. **Seal**
4. **Cover (T10)**
5. **Gaskets**
6. **Cover Fasteners**
7. **Pipe Plugs**
8. **T31 Spacer Hub** (Specify length)
9. **Grid**

When ordering spare parts, give coupling size as stamped on coupling cover and hub.

INTRODUCTION — The Type T31 Steelflex Spacer Assembly is designed to permit installation or removal (as shown in Steps A and B below) without disturbing either the driving or driven unit. It can be used in either horizontal or vertical applications without modification. However, for vertical applications, the match mark shown on Page 2 must be up.

Sizes 80 and 90T10 covers have been manufactured with two and three ribs; DO NOT mix these cover halves. Gaskets fit both designs, but remove the center tab when gaskets are used with two-rib covers.

The performance and life of couplings depends largely upon how you install and service them. Carefully follow the instructions in this manual for optimum performance and trouble free service.

LIMITED END FLOAT — When electric motors, generators, engines, compressors and other machines are fitted with sleeve or straight roller bearings, limited axial end float coupling kits are recommended for protecting the bearings. Consult Falk for details.

CAUTION: Remove the coupling cover, grid and gap disc before removing the Spacer T Hub(s) of limited end float couplings. Reassemble as instructed on Page 2.

LUBRICATION — Depending on the size of the coupling, cover halves have ⅛ or ⅜ NPT lube holes. Use a standard grease gun and lube fitting as instructed in Step 8 on Page 2. Adequate lubrication is essential for proper operation of the coupling. Check the coupling once a year and add lubricant if required. For extreme or unusual operating conditions, check more frequently.

CAUTION: Consult applicable local and national safety codes for proper guarding of rotating shafts and couplings.

LUBRICANT SPECIFICATIONS — Refer to Manual 428-010 for recommended lubricants. The following specifications apply to lubricants for Falk couplings which are lubricated annually and operate within ambient temperatures of 0° to 150°F (−18° to +66°C). For temperatures beyond this range, consult the Factory.

Dropping Point — 300°F (149°C) or higher.

Consistency — NLGI No. 2 with worked penetration value in the range of 250 to 300.

Separation and Resistance — Low oil separation rate and high resistance to separation from centrifuging.

Liquid Constituent — To possess good lubrication properties . . . equivalent to a high quality, well refined petroleum oil.

Inactive — Must not corrode steel or cause swelling or deterioration of synthetic seals.

Clean — Free from foreign inclusions.

Semi-permanent Lubrication — Up to eight years between lubrication checks may be obtained thru the use of "still-bottom" asphaltic based lubricants. Refer to Service Manual 428-012 for details.

CAUTION: Observe all safety rules when installing or servicing couplings.

INSTALLATION — Only standard mechanics tools, wrenches, a straight edge and feeler gauges are required to install Falk Steelflex couplings.

For best results, clean all parts thoroughly and align coupling for minimum angular and parallel misalignment. Set the connected machines to prescribed distance between shaft ends. Align and assemble as shown on Page 2.

Coupling hubs thru Size 90 are generally furnished for a CLEARANCE FIT; Sizes 100 and larger for an INTERFERENCE FIT. Heat hubs with interference fit in an oil bath to a maximum of 275°F (135°C) to mount. The oil flashpoint must be 350°F (177°C) or higher.

s in U.S alk Cor subsidi idstrant tion.
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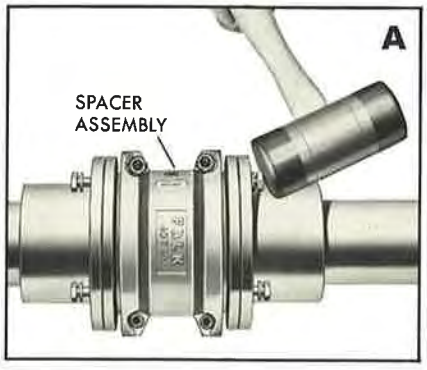
REMOVAL AND INSTALLATION OF SPACER ASSEMBLY

(See Limited End Float "Caution")

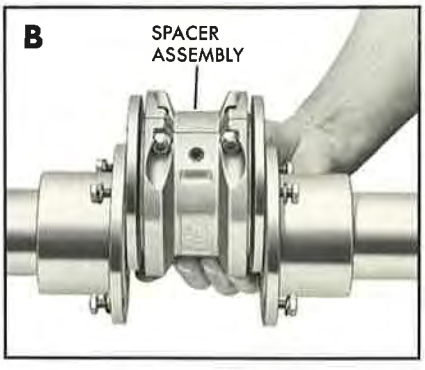


A REMOVE SPACER ASSEMBLY

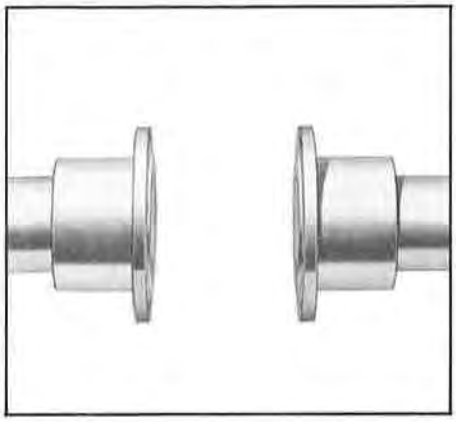
Remove pipe plugs and all but two fasteners opposite each other in each hub. Loosen these about one-quarter inch and tap them with a mallet to disengage Steelflex Spacer from the shaft hubs. Remove fasteners and Spacer.

B INSERT SPACER ASSEMBLY

Insert fasteners as shown — do not allow them to protrude beyond flange face. Compress spacer to eliminate its gap, and insert into space between shaft hubs. Carefully engage the hub registers and then alternately tighten fasteners. Torque to specifications in Step 2 on Page 2.

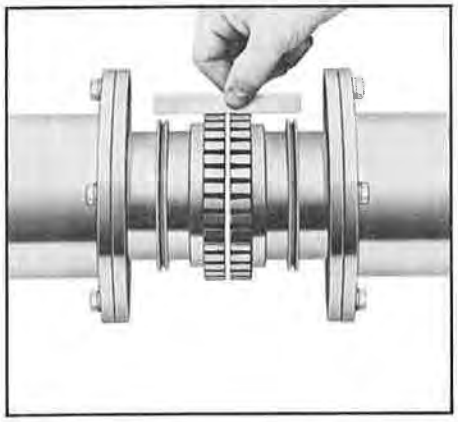


INSTALLATION OF DISASSEMBLED TYPE 31 STEELFLEX SPACER COUPLINGS



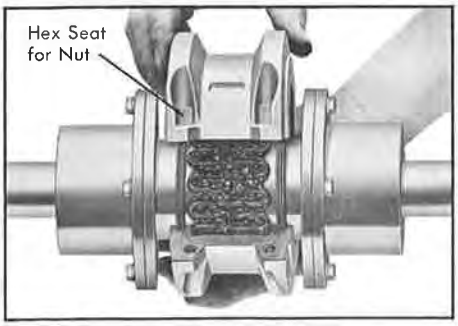
1 MOUNT SHAFT HUBS

Lock out starting switch of prime mover. Mount shaft hubs on their respective shafts so that hub face is flush with the end of the shaft. If hub is furnished for an interference fit, heat in an oil bath as instructed on Page 1. Position units for approximate distance between shaft ends with minimum angular and offset misalignment.



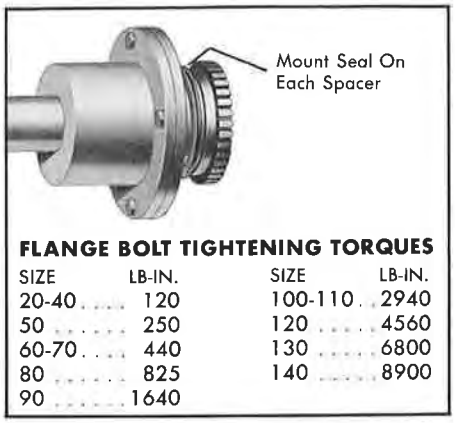
4 OFFSET ALIGNMENT

Align so that a straight edge rests squarely (or within the limits specified in Table 1) on both hubs as shown above and also at 90° intervals. Check with feelers. The clearance must not exceed the OFFSET limit specified in Table 1. Tighten all foundation bolts and repeat Steps 3 and 4. Realign coupling if necessary. NOTE: Use a dial indicator for more accurate alignment.



7 INSTALL COVER

Align seals with cover grooves. Position covers per Step 6 and insert gaskets at both joints. For Sizes 20 thru 70, position nut in hex seats. Insert all fasteners and torque to value specified in Table 1. Insert pipe plugs.

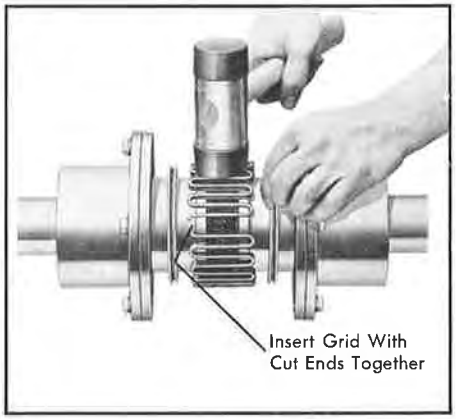


FLANGE BOLT TIGHTENING TORQUES

SIZE	LB-IN.	SIZE	LB-IN.
20-40	120	100-110	2940
50	250	120	4560
60-70	440	130	6800
80	825	140	8900
90	1640		

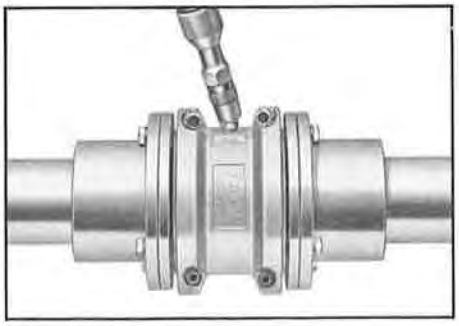
2 MOUNT EACH HALF SPACER

Stretch the seal and carefully roll it over hub teeth into position. Carefully position each half spacer on register of flanged hubs and bolt parts together. Torque fasteners to value specified.



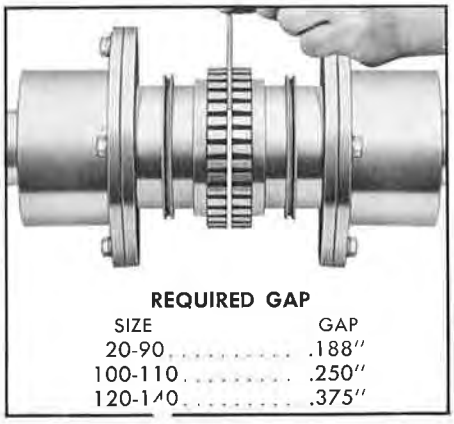
5 INSERT GRID

Pack gap and grooves with lubricant before inserting grid. When grids are furnished in two segments, install them so that all cut ends extend in the same direction. This will assure correct grid contact with the lug in the cover and permit cover installation. Spread the grid slightly to pass it over the coupling teeth and then seat it with a soft mallet. Pack additional grease between and around the grid and then wipe off the excess flush with top of grid.



8 LUBRICATION

Lubricate annually. Refer to Page 1 for recommended lubricant specifications and to Table 1 for amount of lubricant required. When lubricating, remove both pipe plugs and insert a standard lubrication fitting in one hole. When grease flows from the vent hole, replace both plugs. Wipe off excess grease.

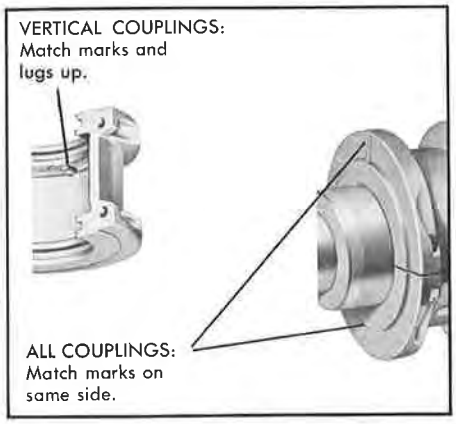


REQUIRED GAP

SIZE	GAP
20-90	.188"
100-110	.250"
120-140	.375"

3 GAP AND ANGULAR ALIGNMENT

Use a spacer bar equal in thickness to the gap as specified. Insert bar, as shown above, to same depth at 90° intervals and measure clearance between bar and hub face with feelers. The difference in minimum and maximum measurements must not exceed the ANGULAR limit specified in Table 1.



6 COVER MATCH MARKS

Assemble the covers with the match marks on the same side. For vertical or inclined couplings, assemble the covers with the match marks (and lugs) UP, or on the high side.

Table 1 INSTALLATION DATA

SIZE	Max Speed rpm	Operating Alignment■ Limits — Inches		Lube Wt (lb)	Cover Fastener Torque lb-in.
		Offset (Max)	Angular (Max)		
20TD	3600	.005	.005	.06	100
20	3600	.005	.005	.06	100
30	3600	.005	.005	.06	100
40	3600	.005	.005	.12	100
50	3600	.005	.005	.12	200
60	3600	.010	.010	.19	200
70	3600	.010	.010	.19	200
80	3600	.010	.010	.38	200
90	3600	.012	.012	.56	200
100	2440	.012	.012	.94	260
110	2250	.012	.012	1.1	260
120	2025	.012	.012	1.6	650
130	1800	.012	.012	2.0	650
140	1650	.015	.015	2.5	650

■ Align couplings within "Operating Alignment Limits" specified above. Exceeding these limits reduces coupling life.

SUPPLEMENT TO SERVICE MANUALS 428-311 and 428-312

Follow the assembly instructions in Service Manuals 428-311 and 312 and the specifications tabulated below. Drawings in these manuals are representative of this series of couplings and do not agree in exact detail with each coupling size. However, the assembly procedure is basically the same for all sizes. To facilitate assembly of the larger covers (Step 7 of 428-311 and 312), use blocks to hold the lower half cover in position. Then insert eyebolts in the other half and lower it into position. Insert cover gaskets and then bolt the cover halves together. Insert lube plugs. Consult Factory for limited end float kits.

TABLE 1 INSTALLATION DATA* (Dimensions-Inches)

SIZE	Gap			Operating■ Alignment Limits		Bolt Tightening Torques (lb-in)		Max Speed (rpm)	Lube Wt (lb)
	Min	Nor-mal	Max	Offset (Max)	Angular (Max)	Flange	Cover		
150T	.062	.250	.500	.015	.015	3960	650	1500	4.2
160T	.062	.250	.500	.015	.015	3960	650	1350	6.2
170T	.062	.250	.500	.015	.015	6400	1300	1225	7.7
180T	.062	.250	.500	.015	.015	6800	1300	1100	8.3
190T	.062	.250	.500	.015	.015	8900	1300	1050	9.7
200T	.062	.250	.500	.015	.015	8900	2300	900	12.4

* Refer to Bulletin 421-110 for maximum bores and Engineering 427-108 for reboring instructions.
■ Align couplings within "Operating Alignment Limits" specified above. Exceeding these limits reduces coupling life and the maximum speed stated.

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Introduction

Adequate lubrication is essential for satisfactory operation. This manual provides a list of typical lubricants and specifications for general purpose and long term greases.

The use of general purpose grease requires re-lubrication of the coupling at least annually. By initially using Falk long term grease (LTG), re-lubrication will not be required again until the connected equipment is stopped for servicing.

Long Term Grease (LTG)

The high centrifugal forces encountered in couplings separate the base oil and thickener of general purpose greases. Heavy thickener which has no lubrication qualities, accumulates in the grid-groove area of Steelflex couplings resulting in premature hub or grid failure unless periodic lubrication cycles are maintained.

LTG (LONG TERM GREASE) Falk LTG was developed specifically for couplings. It resists separation of the oil and thickener. LTG is an extreme pressure grease manufactured to a NLGI #1/2 consistency. While in the container, the consistency changes to a NLGI #2. In working areas of couplings such as the grid-groove area of Steelflex couplings, LTG is in a semifluid condition providing the necessary lubrication. In non-working areas near seals and gaskets, the consistency is comparable to NLGI #2.

Steelflex couplings initially lubricated with Falk Long Term grease (LTG) will not require re-lubrication until the connected equipment is stopped for servicing. If a coupling leaks grease, is exposed to extreme temperatures, excessive moisture or experiences frequent reversals, more frequent lubrication may be required.

USDA Approval

LTG has the United States Department of Agriculture Food Safety & Inspection Service approval for applications where there is no possibility of contact with edible products. (H-2 rating).

CAUTION: Do not use LTG in bearings.

Specifications

The values shown are typical and slight variations are permissible.

AMBIENT TEMPERATURE RANGE — -20°F (-29°C) to 250°F (121°C).

MINIMUM BASE OIL VISCOSITY — 3300SSU (715cST) @ 100°F (38°C)

THICKENER — Lithium & Polyethylene.

CENTRIFUGE SEPARATION CHARACTERISTICS — ASTM #D4425-84 Centrifuge Test) — K36 = 2/24 maximum, very high resistance to centrifuging.

NLGI GRADE (ASTM D-217) — 1/2

CONSISTENCY (ASTM D-217) — 60 stroke worked penetration value in the range of 315 to 360 measured at 77°F (25°C)

MINIMUM DROPPING POINT — 350°F (177°C) min.

TIMKEN EP O.K. LOAD — 40 lbs (18 kg).

ADDITIVES — Rust and oxidation inhibitors that do not corrode steel or swell or deteriorate synthetic seals.

INSPECTION — When connected equipment is serviced, disassemble the coupling and inspect for wear. Replace worn parts. Clean the grease from the coupling and repack with fresh LTG. Install coupling using new gasket as instructed in the appropriate installation manual.

Packaging

14 oz. CARTRIDGES — For use in standard industrial lubrication guns.

35 lb. PAILS — Ideal for larger size couplings or many smaller sizes.

120 lb. KEG — For plants with many small couplings or large size couplings. Best for hand packing.

400 lb. DRUMS — For plants with a pressurized lubrication system.

CASE LOTS — 10 – 14 oz. cartridges, 60 – 14 oz. cartridges.

The Falk Corp., subsidiary of Sundstrand Corp.
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General Purpose Grease

ANNUAL LUBRICATION -- The following specifications and lubricants for general purpose grease apply to Falk Steelflex couplings that are lubricated annually and operate within ambient temperatures of 0° to 150°F (–18° to 66°C) For temperatures beyond this range, consult the Factory.

If coupling leaks grease, is exposed to extreme temperatures, excessive moisture or experiences frequent reversals; more frequent lubrication may be required.

Specifications — General Purpose Coupling Lubricants

The values shown are typical and slight variations are permissible.

DROPPING POINT — 300°F (149°C) or higher.

CONSISTENCY — NLGI No. 2 with 60 stroke worked penetration value in the range of 265 to 295.

SEPARATION AND RESISTANCE — Low oil separation rate and high resistance to separation from centrifuging.

LIQUID CONSTITUENT — Possess good lubricating properties, equivalent to a high quality, well refined petroleum oil.

INACTIVE -- Must not corrode steel or cause swelling or deterioration of synthetic seals.

CLEAN — Free from foreign inclusions.

General Purpose Greases Meeting Falk Specifications

Lubricants listed in Table 1 are typical products only and should not be construed as exclusive recommendations.

TABLE 1 — General Purpose Greases ★

Ambient Temperature Range	0°F to 150°F (–18°C to +66°C)	–30°F to 100° F –34°C to +38°C)
Manufacturer	**Lubricant**	**Lubricant**
Amoco Oil Co.	Amolith Grease #2	Amolith Grease #2
BP Oil Co.	Energrease LS-EP2	Energrease LS-EP1
Chevron U.S.A. Inc.	Dura-Lith EP2	Dura-Lith EP1
Citgo Petroleum Corp.	Premium Lithium Grease EP2	Premium Lithium Grease EP1
Conoco Inc.	EP Conolith Grease #2	EP Conolith Grease #2
Exxon Company, USA	Unirex N2	Unirex N2
E.F. Houghton & Co.	Cosmolube 2	Cosmolube 1
Imperial Oil Ltd.	Unirex N2L	Unirex N2L
Kendall Refining Co.	Lithium Grease L421	Lithium Grease L421
Keystone Div. (Pennwalt) Corp.	81 EP-2	81 EP-1
Lyondell Petrochemical (ARCO)	Litholine H EP 2 Grease	Litholine H EP 2 Grease
Mobil Oil Corp.	Mobilux EP111	Mobilith AW1
Petro-Canada Products	Multipurpose EP2	Multipurpose EP1
Phillips 66 Co.	Philube Blue EP	Philube Blue EP
Shell Oil Co.	Alvania Grease 2	Alvania Grease 2
Shell Canada Ltd.	Alvania Grease 2	Alvania Grease 2
Sun Oil Co.	Ultra Prestige 2EP	Ultra Prestige 2EP
Texaco Lubricants	Starplex HD2	Multifak EP2
Unocal 76 (East & West)	Unoba EP2	Unoba EP2
Valvoline Oil Co.	Multilube Lithium EP Grease	...

★ Grease application or re-lubrication should be done at temperatures above 20°F (7°C). If grease must be applied below 20°F (7°C), consult The Falk Corporation. Lubricants listed may not be suitable for use in the food processing industry; check with lube manufacturer for approved lubricants.

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